

**KNOWLEDGE, ATTITUDES AND APPLICATION OF
EVIDENCE-BASED PRACTICE BY THIRD AND FOURTH
YEAR UNDERGRADUATE NURSING STUDENTS AT THE
UNIVERSITY OF RWANDA (UR).**

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ABSTRACT

Evidence-based practice (EBP) is an important component in improving the health care outcomes of a country's population. Despite the importance and relevance of EBP to nursing, nurses do not routinely understand and use evidence-based principles in their everyday practice. This may influence the attitudes and knowledge of students who do not become exposed to the practice of EBP during their training. Nurses, who are considered to be the backbone of the health care profession, especially in Sub-Saharan Africa, should be introduced to the basic principles of EBP during their pre-registration programmes. Moreover, EBP teaching input should be both theoretical and practical with a continuity throughout the whole nursing programme.

The aim of this study was to determine the knowledge of, attitudes towards and application of EBP by nursing students from the College of Medicine and Health Sciences at the University of Rwanda. The study design was quantitative, descriptive and non-experimental. A total of 82 students participated in the study. An anonymous, self-reported questionnaire was used to collect data from third- and fourth-year nursing students from the College of Medicine and Health Sciences. Ethical approval was obtained from the Human Research Ethics Committee at the University of Cape Town's Health Sciences Faculty, and from the Directorate of Science, Technology and Research at the Rwandan Ministry of Education.

Data were analysed by means of descriptive statistics. The results indicated that most of the third- and fourth-year nursing students at the University of Rwanda had some knowledge of EBP. Thus, respondents reported some negative attitudes towards EBP; no relationship between the respondents' attitudes and their year of study was noted. Only 12% (n=10) of the respondents reported accessing evidence every day. Most respondents reported using the Internet as their primary source of evidence, with limited use of best evidence databases such as Cochrane and Medline. The most common barriers to the implementation of EBP were lack of knowledge, lack of time, and the lack of examples or role modelling from lecturers, clinical instructors and nurse.

Further efforts to integrate EBP as a continuous theoretical and practical part of the nursing curriculum should be made in order to promote the effective use of evidence in practice by students at the College of Medicine and Health Sciences, University of Rwanda.

TABLE OF CONTENTS

DECLARATION	ii
ACKNOWLEDGMENTS.....	iii
ABSTRACT	iv
TABLE OF CONTENTS	v
ABBREVIATIONS.....	xii
CONCEPTUAL DEFINITIONS.....	xiii
CHAPTER 1: INTRODUCTION AND OVERVIEW OF THE STUDY	1
1.1. Introduction and Background.....	1
1.1.1. The Rwandan situation	1
1.1.2. Rwandan health care system.....	2
1.1.3. Health care personnel in Rwanda	2
1.1.4. Health care professional training in Rwanda.....	3
1.1.5. EBP integration at the University of Rwanda	3
1.1.6. Integration of EBP in the general nursing baccalaureate programme	3
1.2. Problem statement	4
1.3. Research question.....	5
1.4. Aim.....	5
1.5. Objectives.....	5
1.6. Significance of the study	6
1.7. Summary	6
CHAPTER 2: LITERATURE REVIEW	7
2.1. Introduction	7
2.2. Search strategies	7
2.3. Definition and historical background of EBP	8

2.3.1.	Brief history of EBP	9
2.3.2.	Brief history of EBP in nursing	10
2.4.	The EBP process	10
2.5.	EBP models in nursing.....	11
2.6.	EBP in clinical nursing.....	12
2.6.1.	Barriers to the clinical application of EBP	13
2.6.2.	A link between EBP teaching and EBP application	13
2.7.	EBP in nursing education.....	14
2.7.1.	Integrating EBP into undergraduate curricula	15
2.7.2.	Integration of EBP into nursing curricula.....	17
2.7.3.	Nursing students' knowledge of, attitudes towards and application of EBP.....	18
2.7.4.	Other Health care students' knowledge of and attitudes towards EBP	19
2.7.5.	Sources of Evidence	19
2.7.6.	Barriers to EBP experienced by students	20
2.7.7.	A need for collaboration for effective application of EBP	21
2.7.8.	Role of information literacy skills	21
2.7.9.	Barriers on the educator's side	22
2.8.	EBP in developing countries	23
2.8.1.	EBP initiatives in sub-Saharan Africa	23
2.9.	Summary	24
CHAPTER 3: METHODOLOGY		26
3.1.	Introduction	26
3.2.	Study design	26
3.3.	Study Setting	26
3.4.	Study population	27
3.4.1.	Inclusion criteria	27
3.4.2.	Exclusion criteria	27

3.5.	Data collection.....	27
3.5.1.	Instrument design	27
3.5.2.	Instrument Validity and Reliability	28
3.5.3.	Validation for the current study.....	28
3.5.4.	Summary of expert feedback	29
3.5.5.	Pilot study	29
3.6.	Data collection procedure.....	30
3.6.1.	Gaining access	30
3.7.	Data management and analysis	31
3.7.1.	Data management	31
3.7.2.	Data analysis.....	31
3.8.	Ethical considerations	32
3.8.1.	Respect for autonomy	32
3.8.2.	Confidentiality & Anonymity.....	32
3.8.3.	Beneficence/non-maleficence.....	32
3.8.4.	Justice	33
3.8.5.	Risks and benefits.....	33
3.8.6.	Vulnerability	33
3.9.	Summary	33
CHAPTER 4: RESULTS		34
4.1.	Introduction	34
4.2.	Self-reported knowledge of EBP	34
4.3.	Self-reported attitudes towards EBP	36
4.3.1.	EBP in relation to time	38
4.3.2.	Personal appreciation of EBP advantages	39
4.3.3.	EBP integration in the nursing curriculum	40
4.4.	Self-reported application of EBP	41

4.4.1.	EBP access.....	41
4.4.2.	Time spent searching for evidence every day	43
4.4.3.	Sources of evidence	44
4.4.3.1.	Raising the role of current best evidence in clinical practice	45
4.4.4.	Self-reported EBP practice	45
4.4.5.	Reasons for not applying/practicing EBP	46
4.4.6.	Future Use of EBP	47
4.4.6.1.	Usefulness of EBP	47
4.4.6.2.	EBP in the future of clinical nursing.....	47
4.4.6.3.	Willingness to practice EBP in the future.....	48
4.4.6.4.	Preferred sources of evidence	49
4.5.	Comparison between year of study and knowledge of and attitudes towards EBP ..	49
4.5.1.	Cross tabulation between self-reported knowledge and year of study	49
4.5.3.	Cross tabulation between Attitudes towards EBP and year of study	50
4.5.4.	Cross tabulation between application of EBP and year of study.....	51
4.6.	Summary	51
CHAPTER 5: DISCUSSION, RECOMMENDATIONS, LIMITATIONS, AND		
CONCLUSION		52
5.1.	Discussion	52
5.1.1.	Self-reported knowledge of evidence-based practice	52
5.1.1.1.	Relationship between Knowledge of EBP and year of study	53
5.1.2.	Self-reported attitudes towards EBP.....	54
5.1.3.	Current and future application/use of Evidence-Based Practice	55
5.2.	Recommendations	57
5.2.1.	Recommendations for Nursing Education.....	57
5.2.2.	Nursing education management	58
5.2.3.	Further research	59

5.3. Strengths and Limitations of the study.....	59
5.4. Conclusion.....	60
REFERENCES.....	62
APPENDICES.....	71
I. Search strategies.....	71
II. Questionnaire	75
III. Change made to the Knowledge, Attitudes and Behaviours Questionnaire	80
IV. Expert panel information letter and consent form.....	82
V. Content and Face validation checklists.....	84
VI. Expert opinion on the CVI of the questionnaire.	87
VII. Letter to the Ministry of Education	90
VIII. Information Sheet.....	91
IX. Ethical approval from the Faculty of Health Sciences, University of Cape Town ...	93
X. Approval from the Rwandan, Ministry of Education	94
XI. Informed Consent.....	96

LIST OF TABLES

Table 1: Classification of evidence.....	11
Table 2: Self-reported knowledge of EBP	35
Table 3: Self-reported attitudes towards EBP	37
Table 4: Personal appreciation of EBP advantages	40
Table 5: EBP integration in the nursing curriculum	41
Table 6: EBP access by third- and fourth-year nursing students	42
Table 7: Time spent searching for evidence	44
Table 8: Role of current evidence during clinical rounds/sessions.....	45
Table 9: Self-reported EBP practice	46
Table 10: Usefulness of EBP in future practice	47
Table 11: EBP in the future of clinical nursing.	48
Table 12: Willingness to practice EBP in the future.....	48
Table 13: Cross tabulation between self-reported knowledge and year of study	50
Table 14: Cross tabulation between Attitudes towards EBP and year of study.....	50

LIST OF FIGURES

Figure 1: Respondents' self-reported knowledge of EBP	36
Figure 2: Respondents' self-reported attitudes towards EBP	38
Figure 3: EBP takes too much time from busy nursing students.....	39
Figure 4: EBP access by third- and fourth-year nursing students.....	43
Figure 5: Sources of evidence.....	44
Figure 6: Reasons for not applying EBP.....	46
Figure 7 : Preferred sources of evidence.....	49

ABBREVIATIONS

APA	American Psychological Association
BSN	Bachelor of Science in Nursing
CEBHA	Collaboration for Evidence Based Health Care in Africa
CMHS	College of Medicine and Health Sciences
CVI	Content Validity Index
EBHC	Evidence Based Health Care
EBP	Evidence Based Practice
KAB	Knowledge, Attitudes and Behaviours
KABQ	Knowledge, Attitudes and Behaviours Questionnaire
KHI	Kigali Health Institute
RCTs	Randomized Controlled Trials
SPSS	Statistical Package for the Social Services
UCT	University of Cape Town
UR	University of Rwanda
WHO	World Health Organization

CONCEPTUAL DEFINITIONS

Application	‘The action or fact of putting something to a use or purpose; employment, specific use.’ (Oxford English Dictionary, 2015)
Attitudes	‘A learned tendency or readiness to evaluate things or react to some ideas, persons or situations in certain ways, either consciously or unconsciously. Attitudes are underpinned by values and beliefs and have an influence on behaviour.’ (UNESCO IBE, 2013)
Evidence	‘The available body of facts or information indicating whether a belief or proposition is true or valid.’ (New Oxford American Dictionary, 2011)
Curriculum	‘A description of what, why, how and how well students should learn in a systematic and intentional way.’ (UNESCO IBE, 2011)
Evidence based	‘Disciplines of health care that proceed empirically with regard to the patient and reject more traditional protocols.’ (New Oxford American Dictionary, 2011)
Knowledge	‘The body of concepts and factual information (data), including their interrelated structures and patterns, concerning the natural and social environment as well as our understanding of the world, people and society, gained through learning and/or experience.’ (UNESCO IBE, 2013)

CHAPTER 1: INTRODUCTION AND OVERVIEW OF THE STUDY

1.1. Introduction and Background

Evidence-based practice (EBP) is a very important component in improving health care outcomes of a country's population (Brown, Wickline, Ecoff & Glaser, 2009). The term 'evidence-based practice' (EBP) refers to a complexity of three interconnected sources of information or evidence: clinical experience, research evidence and patient values or preferences (Straus, Glasziou, Richardson & Haynes, 2011). During the last two decades, EBP has become increasingly important to health care professionals, as it was shown to improve patient outcomes when compared to traditional or clinical expertise alone (Craig & Smyth, 2007). EBP implies efficacy and efficiency, which both lead to effectiveness in health care provision (Dearholt & Dang, 2012).

Health care professionals should be trained to utilize EBP principles from the early stages of their academic training (Dawes et al., 2005). Every source should be considered and relationships between sources should be established before making any clinical decision (Straus et al., 2011). In nursing education, the teaching input of EBP varies from institution to institution. In Africa, the health care system lags behind the high-income countries with a considerable shortage of human or material resources. As a result, a limited integration of EBP is adopted in clinical practice and nursing education (Forland, Rohwer, Klatser, Boer, & Mayanja-Kizza, 2013). Rwanda, a sub-Saharan post-genocide country is no exception with respect to the shortage of human and material resources that affect the African health care system and health professionals' education (Dussault, Codjia, Kantengwga, & Tulenko, 2008). This research study aims to determine the knowledge, attitudes and application of EBP by nursing students from the College of Nursing and Health Sciences at the University of Rwanda.

1.1.1. The Rwandan situation

Located in the central/eastern part of Africa, Rwanda is a landlocked small country (26,338sq km) bordered by Burundi in the south, Uganda in the north, Tanzania in the east and the Democratic Republic of Congo (DRC) in the west. Rwanda is the most densely populated country in Africa with a population estimated to be 12,661,733 in 2015.

The Rwandan population is predominantly young (Central Intelligence Agency, 2015). Rwanda's past history was marked by ethnic divisions and extreme poverty which led the country to a most horrifying genocide in 1994. Many lives were lost, the existing infrastructure was destroyed, and the country's poor economic situation was aggravated. The post-genocide period is however marked by a rapid economic growth and reconstitution (Binagwaho et al., 2014).

1.1.2. Rwandan health care system

Health care in Rwanda has improved markedly over the last twenty years; life expectancy has doubled, the death rate of children younger than five years has fallen by half and malaria deaths have fallen by two thirds (Binagwaho et al., 2014).

The Rwandan health care system is a decentralized, multi-tiered system. In 2012, Rwanda had a total of 748 public and private health care facilities (Rwanda Ministry of Health, 2012). At the core community level, there is a structured system of community health workers who are directly linked to health centres run by nurses. Nurses are responsible for training community health workers (Binagwaho et al., 2014).

The current major health challenges in Rwanda are malnutrition, maternal and child mortality and infectious diseases; in particular, malaria, tuberculosis, hepatitis and HIV/AIDS (Binagwaho et al., 2014; Central Intelligence Agency, 2015).

1.1.3. Health care personnel in Rwanda

The World Health Organization (WHO) recommended a minimum combined health provider ratio of 2.3 health care providers per 1000 population (WHO, 2006). Rwanda falls short of this recommended minimum as it currently has a ratio of 0.84 health care professionals (physicians, nurses and midwives) per 1000 population (Farmer et al., 2013). This shortage of health care professionals constitutes a major barrier to the delivery of quality care to patients. A health survey conducted in 2011 reported that 625 physicians, 8273 nurses and 240 midwives served the whole country (Rwanda Ministry of Health, 2012). This very limited number of health care personnel is supported by an estimated 45,000 trained community health care workers offering basic diagnosis and simple treatment services, with a great emphasis on health promotion in all Rwandan villages (Binagwaho et al., 2013).

1.1.4. Health care professional training in Rwanda

The Rwandan health statistics for 2012 report that most physicians and nurses are trained as generalists and more than 90% of nurses are products of secondary school training in nursing; this is the most basic training in nursing available (Binagwaho et al., 2013).

Until early in 2013, the Kigali Health Institute (KHI) was the leading institute in Rwanda for training nurses and other health care professionals. The Institute was established in 1996 with three faculties: Health Sciences, Nursing and Community Development. Nursing training was also offered by five post-secondary nursing and midwifery schools, through a three-year nursing diploma training programme (Binagwaho et al., 2013). In 2013, the government of Rwanda established one public University known as the University of Rwanda. This university combines all public higher learning institutes and schools. The School of Medicine, School of Public Health, Kigali Health Institute and the five post-secondary schools of nursing currently operate as one college: the College of Medicine and Health Sciences.

1.1.5. EBP integration at the University of Rwanda

The Kigali Health Institute, currently operating as part of the College of Medicine and Health Sciences at the University of Rwanda, established the first general nursing baccalaureate programme in 2006 (Dussault et al., 2008). The programme was established with the purpose of addressing the shortage of nurses and increasing the number and quality of trained nurses to meet the demands of the changing health care environment. The curriculum for the Bachelor of Science in Nursing (BSN) is organized in a modular format. The curriculum follows the principle of student-centred teaching in which a third of the total hours of each module is devoted to face-to-face teaching, with the balance for self-directed learning and practical exercises (Kigali Health Institute, 2013).

1.1.6. Integration of EBP in the general nursing baccalaureate programme

The teaching and practice of EBP is one of the BSN programme outcomes. Graduates are expected to utilize scholarly skills and existing research findings to design evidence-based protocols to be used in different practice settings. Students are expected to develop, progressively, the ability to analyse current scientific evidence critically.

In the current curriculum, however, EBP only appears once as a three-hour session included in the medical-surgical nursing unit at the beginning of the second year (Kigali Health Institute, 2013).

Clinical instructors are then expected to encourage their students continuously to use EBP principles in their practice. There is no written guideline or any other instrument concerning EBP; no evaluation tool is available to measure whether students have achieved a desirable level of EBP. Research methodology and statistics are also included in the curriculum; however these are more focused on training students on how to generate evidence rather than on the use of available evidence. Students take a short course in computer literacy which does not include database searches or other skills in literature searching (Kigali Health Institute, 2013). It is not known whether students obtain sufficient knowledge and skills from such a short exposure to EBP, with variable levels of encouragement from clinical instructors. The researcher's experience as a clinical instructor in the Kigali Health Institute showed that students were unable to evaluate sources of information. Most of them relied on class notes or opinions from other health care practitioners.

Students were reluctant to use the few available resources such as the college or hospital libraries. Most of them either struggled with formulating a clinical question or could not see the need for doing so. They did not know where, why and how to obtain relevant information to inform their practice.

1.2. Problem statement

Evidence-based practice is an essential component contributing to the improvement of health care delivered to a country's population (Craig & Smyth, 2007). It is well known that nurses play an important role in the improvement of health care because of their numbers and the nature of the work (Dearholt & Dang, 2012). Despite the importance and relevance of EBP to nursing, nurses lack sufficient understanding and fail to use evidence-based principles in their everyday practice; this also applies to nursing students who are being trained to be the future generation of nurses (Jonsen, Melender & Hilli, 2013). In Rwanda, as in many other developing countries, nursing education is transitioning from a traditional to a modern curricula based system (Dussault et al., 2008).

The Department of General Nursing in the School of Nursing and Midwifery /College of Medicine and Health Sciences (University of Rwanda) designed a four-year-bachelor's degree curriculum in which EBP is listed among the programme's expected outcomes. EBP is, however, only allocated a three-hour teaching input at the beginning of the second year of the four-year programme. It is therefore not known whether students receive enough theoretical guidance to enable them to develop sufficient basic understanding and appreciation of EBP before they graduate.

This study aims to determine the knowledge of, attitudes towards, and application of EBP by third- and fourth-year nursing students. These third- and fourth-year students are targeted because they would have encountered the three-hour EBP teaching input early in their second year of study.

1.3. Research question

What is the knowledge of, attitudes towards and application of evidence-based practice by third- and fourth-year undergraduate nursing students at the University of Rwanda (CMHS/UR)?

1.4. Aim

The aim of this study was to determine self-perceived knowledge of, attitudes towards and application of evidence-based practice by third- and fourth-year undergraduate nursing students at the University of Rwanda.

1.5. Objectives

1. To determine the self-perceived knowledge of third- and fourth-year undergraduate nursing students with respect to evidence-based practice.
2. To determine third- and fourth-year nursing students' self-perceived attitudes towards evidence-based practice.
3. To determine self-perceived application of evidence-based practice by third- and fourth-year nursing students
4. To compare third- and fourth-year students self-reported knowledge, attitudes and application of evidence-based practice.

1.6. Significance of the study

The information generated by this study is expected to inform nursing students and nurse educators about the students' knowledge of, attitudes towards, and application of EBP. Results from this study will assist nurse educators in reviewing and adjusting the nursing curriculum with regard to EBP, by determining potential shortcomings that need to be addressed in the teaching and clinical application of EBP.

1.7. Summary

Evidence-based practice is essential for improving patient health outcomes; therefore, nurses who constitute the greater part of the health care system in Rwanda need to be able to apply EBP principles. The most effective way to prepare nurses to apply EBP principles is to ensure early integration of EBP into the nursing curricula. Such integration needs to be crosscutting and should be evaluated for effectiveness. This study aims at determining the knowledge of, attitudes towards and application of EBP by nursing students at the University of Rwanda.

This chapter one has presented the study background, the problem statement, the research question, objectives and the significance of the study. Chapter two reviews the literature relevant to the study. Chapter three describes the methods and study design. Chapter four presents the results and chapter five discusses those results. Finally, chapter six provides recommendations, lists limitations, and offers a general conclusion.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

Evidence-based practice (EBP) is believed to improve patient outcomes by weaving three important aspects of patient care together: these are clinical experience, research evidence and patients' values (Straus et al., 2011). Nurses are considered to be a very important force with regard to improving the quality of health care since they constitute the greater part of the health care personnel complement, especially in sub-Saharan Africa. It is therefore important for nurses to understand and apply EBP principles adequately, in order to achieve quality improvement (Dearholt & Dang, 2012).

One of the most effective ways of preparing nurses to use EBP principles is through integrating EBP into nursing curricula. This integration needs to be both theoretical and practical to provide effective outcomes. There are no universal guidelines about how and when to integrate EBP into nursing curricula. Different nursing programmes have adopted different methods of integration.

In this chapter, the literature review is discussed under the following themes:

- Definition and historical background of EBP
- The EBP process
- EBP in clinical nursing
- EBP in nursing education
- EBP in developing countries
- Summary

2.2. Search strategies

A literature search was conducted in English. The following key words were used: knowledge OR awareness AND evidence-based practice OR evidence-based nursing AND nursing students OR apprentices (see Appendix I). The UCT library databases, namely CINAHL, PUBMED, SCOPUS and AFRICA WIDE, were searched. Rwandan government publications and World Health Organization (WHO) reports were accessed through GOOGLE SCHOLAR.

Articles published during the period 2004-2015 were deemed to be convenient for providing relevant and updated information. References from articles and books were used to identify and search for possible relevant primary sources. A total of 70 full text articles were retained and relevant textbooks from the University of Cape Town's, Health Sciences library were used.

2.3. Definition and historical background of EBP

The evidence-based concept was initially limited to medicine, and was known as 'evidence-based medicine' (EBM). It was initially defined as "the conscientious, explicit and judicious use of current best evidence in making decisions about the health care of patients" (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, p. 71). EBM principles subsequently expanded to be used in health care in general. EBM has been integrated in nursing, dentistry, physiotherapy, occupational therapy and many other health care disciplines (Straus et al., 2011, p. 2). In response to the expansion of EBM principles to other health care disciplines, a common terminology was agreed upon; hence EBM began to be known as 'evidence-based practice' or 'evidence-based health care' in health care professions (Dawes et al., 2005).

The initial definition of EBM was revised to include, explicitly, the value of clinical experience, and patients' perspectives; taking this into account EBM is defined as "the integration of the best research evidence with our clinical expertise and our patient's unique values and circumstances" (Straus et al., 2011, p. 1). This definition is a combination of four important aspects. Firstly, "best research evidence" is defined as clinically applicable research derived mainly from patient-centered clinical research (Straus et al., 2011, p. 1). Secondly, "clinical expertise" is defined as the capacity to combine clinical skills and past experience while responding to each patient's health problems, and taking into consideration each patient's risks and benefits, and their personal values and expectations (Straus et al., 2011, p. 1). Thirdly, "patient values" is defined as health problems, anticipated results and preferred solutions which are unique to every patient and specific at each encounter (Straus et al., 2011, p. 1). Finally 'patient circumstances', refers to "their individual clinical state and the clinical setting" (Straus et al., 2011, p. 1). EBM goes beyond integration of best research evidence in patient care; it includes knowledge drawn from experience as well as the uniqueness and specificity of each individual.

2.3.1. Brief history of EBP

Before the introduction of EBP, patient care was dependent on the experiences and opinions of health care professionals involved in providing a specific treatment or performing a certain procedure (Kania-Lachance, Best, McDonah & Ghosh, 2006). EBP moved health care professionals beyond depending on personal opinions and views to using official protocols and procedures based on scientific inquiry and research.

The evidence-based concept is not conceptually new; its roots go back many decades. The most documented work is that of a British epidemiologist, Dr. Archie Cochrane, who in 1972 criticised medical practice for not conducting systematic reviews of existing studies and for administering treatments not supported by evidence (Shah & Chung, 2009). The term ‘evidence-based medicine’ was first used in 1992 at McMaster University, Medical School in Canada by Gordon Guyatt and the group he was leading (Cullum, Ciliska, Haynes & Marks, 2008). Based on Cochrane’s work, the Cochrane Centre was established in Oxford, England, in 1992, followed by the establishment of the Cochrane Collaboration. Both the Centre and Collaboration have one primary goal which is to assist health care professionals in making evidence-based decisions. This goal is achieved through publication of regular updated systematic reviews, which contribute to improvement of health care outcomes (Shah & Chung, 2009).

Apart from the Cochrane Centre and Collaboration, many other worldwide evidence-based initiatives now exist in the form of forums, centres and institutes located mostly in developed countries (Thiel & Ghosh, 2008). The Joanna Briggs Institute (JBI) established in 1996 in Australia is one of these. The JBI is committed to contribute toward the implementation of EBP for the improvement of health care outcomes globally and it provides access to evidence-based materials to health care professionals worldwide. JBI also raises awareness and empowers nurses, medical doctors and allied health professionals to use EBP through training programmes, short courses and degree courses (JBI, 2014). To date, more than 70 Collaboration centres and organizations in 28 countries subscribe to JBI resources. Eight JBI collaboration centres are in Africa and a fellowship programme supports students from Africa (JBI, 2014).

2.3.2. Brief history of EBP in nursing

The principles of EBP were applied by Florence Nightingale who is considered to be one of the nursing pioneers. Nightingale's work reflects EBP although the terminology was not yet in use (Aravind & Chung, 2010). It is argued that EBP was a central concept of Nightingale's theory of nursing and health care; examples from her work include the establishment of a systematic data collection system which reflects an evidence-based framework (Aravind & Chung, 2010).

Nursing as a profession became part of the EBP movement in the late 1990s (Stevens, 2013). Since then, nurses across different specialties have launched various initiatives with regard to EBP practice, education and curricular realignment, model and theory development, as well as scientific engagement in the new fields of research such as systematic reviews (Stevens, 2013).

2.4. The EBP process

According to Dawes et al. (2005) the application of EBP follows a pattern of five important steps. The first step consists of 'asking a clear clinical question that will generate the best evidence'. It is commonly agreed that this question should be asked in a **PICO** format; **P**atient/ **P**opulation, **I**ntervention of interest, **C**omparison intervention and **O**utcome (Fineout-Overholt & Johnston, 2005).

The second step consists of 'searching for the best evidence'. Here, one is advised to begin with systematic reviews or meta-analyses and evidence-based clinical practice guidelines because these constitute the strongest sources of evidence (Melnyk & Fineout-Overholt, 2005). By using information from Guyatt and Rennie's work conducted from 2002 onwards, Melnyk & Fineout-Overholt (2005) have summarized evidence resources according to their hierarchical order of use: see Table 1.

Table 1: Classification of evidence

Classification	Source of Evidence
Level 1	Evidence from a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs) or evidence-based clinical practice guidelines based on systematic reviews.
Level 2	Evidence obtained from well-designed randomized controlled trials (RCTs).
Level 3	Evidence obtained from well-designed controlled trials without randomization.
Level 4	Evidence from well-designed case-control and cohort studies.
Level 5	Evidence from systematic reviews of descriptive and qualitative studies.
Level 6	Evidence from a single descriptive or qualitative study.
Level 7	Evidence from the opinions of authorities and/or reports of expert committees.

(Melnik & Fineout-Overholt, 2005)

The third step in the EBP process is ‘critical appraisal’ of the evidence, which consists of determining the applicability of the evidence and the level of contextualization needed (Melnik & Fineout-Overholt, 2005). The fourth step requires careful ‘integration of the evidence’ found from the literature with other components of EBP such as health care provider’s experience, clinical assessment of the patient and available health care resources, as well as patients’ preferences and values (Fineout-Overholt & Johnston 2005).

The last step consists of the ‘evaluation of effectiveness’ of the evidence with a particular patient or setting as well as providing information for possible adjustments, especially context-related adjustments (Fineout-Overholt & Johnston 2005).

2.5. EBP models in nursing

Governments and non-governmental organizations, universities and individuals have been striving to promote the translation of science in nursing, focusing on research and EBP. This effort is mainly observed in developing countries.

Among the many achievements is the development and publication of theoretical models for translational science in nursing. Those models have been developed to help nurses understand and apply research and EBP in practice, education and management (Stevens, 2013).

To date forty-seven major models have been identified. Mitchell and colleagues grouped these into four thematic areas (Mitchell, Fisher, Hastings, Silverman & Wallen, 2010). The first group comprises models that focus on '*Research Utilization and Knowledge Transformation Processes*'. The second group comprises models focusing on '*Strategic/Organizational Change Theory to Promote Uptake and Adoption of New Knowledge*'. The third group combines models concerned with '*Knowledge Exchange and Synthesis for Application and Inquiry*' and the last group focuses on '*Designing and Interpreting Dissemination Research*' (Mitchell et al., 2010, p. 287). Each group comprises a different number of models. Thus, the first thematic group contains eight models, including the John Hopkins Nursing Evidence-Based Practice Model and Guidelines and the ACE Star Model of Knowledge Transformation, which are both widely used in nursing practice and education (Dearholt & Dang, 2012; Mitchell et al., 2010; Stevens, 2013). The second group contains thirteen models. The third group comprises eight models, and the last group eighteen models (Mitchell et al., 2010). Most of these models, if not all, have been developed in industrialized countries. Although some of these can be adapted to the developing world context, there is a need for models specific to the socio-economic and cultural context of developing countries.

2.6. EBP in clinical nursing

A USA-based cross-sectional, descriptive study examined the utilization, knowledge and attitudes toward EBP among nursing staff, using a total of 593 respondents; it reported that nurses had positive attitudes concerning their knowledge and practice of EBP. This study used a clinical effectiveness and evidence-based practice questionnaire with three main subscales; attitudes, knowledge and practice of EBP. The attitudes subscale scored highest and the practice subscale scored the lowest (White-Williams et al., 2013). Positive attitudes were also reported in another similar study where most nurses were in agreement with the fact that EBP is relevant for their practice (Milner, Estabrooks, & Myrick, 2006). A cross-sectional study was conducted in Norway with 356 nurse respondents and concluded that 52% of the respondents had positive attitudes towards EBP, with only limited application (Stokke, Olsen, Espehaug, & Nortvedt 2014).

In 2005, Pravikoff and colleagues conducted a study to determine the readiness of U.S. nurses to practice EBP, with 3000 nurses randomly stratified across the USA. This study reported that more than half of the nurses who participated in their study lacked knowledge of EBP principles and its importance. In this study, only 46% of nurses were familiar with the term 'evidence-based practice,' 58% of the study participants did not seek evidence to support their practice, 82% had never used hospital libraries, and 76% had never done a search on CINAHL while only 58% had used MEDLINE before (Pravikoff, Tanner & Pierce, 2005). Most of the surveyed nurses preferred using only books for evidence, even though book knowledge alone is not enough to respond to the complexities of EBP requirements, or for shaping critical thinking and decision making (Egerod & Hansen, 2005; Pravikoff et al., 2005).

2.6.1. Barriers to the clinical application of EBP

A number of barriers to the application of EBP have been reported by nurses and other health care professionals: these include a lack of knowledge regarding EBP strategies, misconceptions about research and EBP, voluminous amounts of information in professional journals and a lack of time and resources to search for and appraise evidence (Forland et al., 2013; McKenna, Ashton & Keeney, 2004). A cross-sectional study was conducted by Brown and colleagues with a sample of 458 nurses obtained after a convenience sampling procedure; this survey reported that a lack of knowledge and time were the most prominent barriers to the application of EBP. Lack of knowledge was associated with having no education background in research and EBP (Brown et al., 2009). Other barriers reported by Upton and Upton (2006) were lack of resources and time. Similarly Rabe, Holmen, and Sjogren (2007), in a study including 290 dental professionals from Sweden, reported that the most prevailing perceived barriers to EBP were lack of time and poor availability of evidence

2.6.2. A link between EBP teaching and EBP application

Eizenberg (2011) claimed that knowledge of, and attitudes towards EBP, go hand-in-hand with the level of education; this writer argued that nurses with a university degree are more likely to apply EBP principles than their colleagues without a degree. In Britain, nurses reported an improvement in their critical appraisal of research, searching skills, ability to use study findings in their work and their discussion of research with their colleagues, as a result of their university education (Veeramah, 2004).

It was, therefore, argued that nurses who are exposed to a research course and an EBP course as part of their university education are more likely to have more knowledge of, and positive attitudes towards EBP when compared to those nurses who are not exposed (Veeramah, 2004). A lack of knowledge and skills to evaluate and use research findings was identified as one of the barriers to the use of EBP; therefore, a number of studies have recommended educating nurses in research and critical appraisal of scientific journals (Egerod & Hansen, 2005; Pravikoff et al., 2005; Thompson, Estabrooks, Scott-Findlay, Moore & Wallin, 2007).

2.7. EBP in nursing education

It is argued that for as long as nursing curricula are not EBP focused, graduates will fail to understand and integrate the concept of ‘best practice.’ However, the postmodern society expects nurses and other health care professionals to dispense the best available care. EBP should therefore, be integrated into nursing education programmes to promote best-care (Warne, Holland & McAndrew, 2011). Integration of EBP into the early stages of nursing training facilitates the development of nursing graduates who are able to influence policy and initiate changes in health care systems (Killeen & Barnfather, 2005). Students who are taught and encouraged to use EBP during their undergraduate education are more likely to continue using EBP after they graduate (Eddy, 2005).

It is the role of universities, nursing leadership, policy makers and other relevant organizations to ensure that nurses are equipped with EBP knowledge and skills. A supporting and promoting culture, with regard to EBP and on behalf of the nursing leadership, will positively impact nurses and nursing students’ attitudes towards EBP (Sredl et al., 2011; Wallen et al., 2010). For students, however, the role of the university is critical to the effective preparation of students for use of EBP after graduation (Hickman, Kelly & Phillips, 2014). EBP in nursing, as with many other nursing skills, should be applied in clinical settings. It is argued that the nursing education field has not proposed sufficient strategies in the form of opportunities to expose nursing students to an effective clinical application of EBP (Moch, Cronje & Branson, 2010).

There is a misconception about the relationship between EBP and research, even among nurse educators. Nursing curricula focus on research in the expectation that students are being prepared to apply EBP adequately, but without an actual component of EBP in their training (Foster, 2004). This misconception is accompanied by an ambiguity about the appropriate time to introduce EBP to nursing students. Students who are introduced to EBP early in their training programme are more likely to develop an interest in EBP, as well as more advanced critical thinking skills, satisfactory professional growth and a better use of research findings (Killeen & Barnfather, 2005).

There is no pre-defined, clear framework of how to integrate EBP into nursing curricula (Burns & Foley, 2005). Different universities have adopted different innovative teaching strategies that are appropriate to their contexts. Most of those strategies remain untested in terms of process and outcomes (Ferguson & Day, 2005). Without any evidence of binomial education, EBP literature only offers successful examples of faculties that are teaching EBP (Ciliska, 2005). Nurse educators and researchers argue that both knowledge and skills are required for an effective application of EBP, and it has become standard practice, to some degree, for the content of EBP teaching to be based on phases of the EBP process (Ciliska, 2005; Dawes et al., 2005; Melnyk & Fineout-Overholt, 2005; Moch et al., 2010)

2.7.1. Integrating EBP into undergraduate curricula

Effective integration of EBP includes both theoretical and clinical integration. Clinical teaching of EBP improves students' attitudes and their ability to apply EBP in clinical practice (Mattila & Eriksson, 2007; Meeker, Jones & Flanagan, 2008). Students' knowledge, skills, attitudes and behaviours improve considerably with clinically situated teaching of EBP (Mattila & Eriksson, 2007). Theoretical teaching of EBP is also effective, but it only focuses on knowledge acquisition (Coomarasamy & Khan, 2004).

Ciliska (2005) acknowledged the importance of teaching research methodology and statistics to help students generate and consume available research, but suggested that additional skills related to EBP are required. She recommended integration of EBP into nursing curricula across different levels with related assessment methods (Ciliska, 2005).

Problem-based learning was suggested as one effective method to teach EBP in nursing educational programmes (Fineout-Overholt, Stillwell & Kent, 2008).

Journal clubs have been argued to be effective in improving critical appraisal, knowledge and skills as well as engaging students in discussions about research and its applicability within the clinical context (Deenadayalan, Grimmer-Somers, Prior & Kumar, 2008).

Simulation, a commonly-used teaching method in nursing, using learning exercises similar to real-life situations, has also been suggested for teaching EBP. Waxman (2010) recommended that the development of EBP simulation scenarios was essential for teaching EBP to nurses. Such scenarios would allow students to practice EBP principles in a safer environment. EBP simulation scenarios can be developed from existing evidence-based guidelines (Waxman, 2010).

Two models have been reported as being useful in teaching EBP. The first of these is the ACE Star Model which uses the cycle of knowledge and transformation, and a five-point star to illustrate five stages of knowledge and transformation (Stevens, 2013). Knowledge transformation consists of converting findings from primary research in different forms that will be used to impact health care outcomes. The five stages illustrated by a five-point star are:

- Knowledge discovery, by means of research methodologies and scientific inquiries. In this stage, primary research is conducted through a variety of research designs such as descriptive, randomized controlled trials and many others.
- Evidence summary is a step that is very specific to EBP whereby research knowledge is summarized in a simple, understandable and usable form.
- Knowledge is then translated into guidelines which are adapted to time, cost and care standard and can be easily used by clinicians in practice.
- The next stage is implementation or integration, which is a process of applying the knowledge and improving practices on both the individual and organizational level.
- Finally, the evaluation stage is reached. This is a very important step wherever transformation is concerned. The overall goal of this evaluation focuses on health outcomes, patient satisfaction as well as health status impact (Stevens, 2013).

The second commonly-used model is the Cycle of Learning Model, developed by the University of Rochester's School of Nursing, and based on Sackett and colleagues' EBP process to assist educators and students in integrating EBP.

It is similar to the ACE Star model and is supported by a three-point foundation: knowledge of research methods, clinical experience and judgment and context (Fineout-Overholt & Johnston, 2005).

2.7.2. Integration of EBP into nursing curricula

In most of the nursing curricula where EBP has been integrated, it has been based on the five steps of EBP commonly known as the ‘five A’s’: formulating an answerable clinical question (Asking); finding the best available answer to this question (Acquiring); critically evaluating the evidence (Appraising); applying the evidence to the client (Applying); and, monitoring the performance in relation to the evidence (Assessing) (Dawes et al., 2005; Spek, Wieringa-de Waard, Lucas & van Dijk, 2013). These steps are continuously explored over the duration of the training programme. First-year students are taught to navigate the Internet, how to formulate learning questions and how to reference. In their second year, students are taught how to formulate answerable clinical questions in a PICO format, search evidence using appropriate databases and critically appraise the evidence. At this level, training is conducted in the form of lectures and training sessions with opportunities to apply EBP-acquired knowledge and skills by working in small groups. In their third year, students are asked to develop a clinical EBP guideline in groups; training at this stage focuses on critical appraisal, research methodology and rating the evidence. All EBP steps are integrated in year three and four clinical assignments (Finotto, Carpanoni, Turrone, Camellini, & Mecugni, 2013; Spek et al., 2013).

Ciliska (2005) proposed a framework for integrating EBP into nursing curricula with the following expectations. Thus, first-year students would be expected to know how to formulate clinical questions and search common databases. Second-year students would build on their first-year knowledge but with more emphasis on critical appraisal of different interventions and research publications. In their third year, students would continue in the previous direction of critical appraisal and searching more complex sources. Final-year students would be expected to perform a high level of integration by linking practice to EBP. For each level, using EBP while developing care plans would be a major requirement.

From a constructivist tradition Rolloff (2010) proposed a model that can be used with nursing schools when integrating EBP into their curricula. In their first year, students would be taught to define EBP, assisted to develop information literacy skills and taught how to assess the quality of websites. In their second year, students would be taught to explore systematic review databases for evidence related to laboratory experiences, critique websites for health information, and introduce other information literacy sources. In their third year, students would be taught to define research processes, critique research articles, critique clinical experiences from an EBP perspective and incorporate EBP into patient care plans. In their final year, students would be assisted to develop a research proposal based on evidence gaps identified in practice, evaluate clinical policies and procedures from an EBP perspective and discuss change processes related to EBP (Rolloff, 2010).

2.7.3. Nursing students' knowledge of, attitudes towards and application of EBP

The successful application of EBP requires knowledge and skills to develop appropriate research questions, search and critically appraise relevant literature, then evaluate the transferability of research evidence to clinical practice. It has been reported that most nursing students and nurses in clinical practice were aware of the five steps of the EBP process and that this knowledge increased with their year of study or academic qualification (Kim, Brown, Fields, & Stichler 2009; Lai, Teng & Lee, 2010)

Attitudes towards EBP tend to vary in accordance with the respondent's knowledge and skills of EBP (Stokke et al., 2014). A lack of critical appraisal and advanced literature search skills may trigger negative attitudes towards EBP (Brown et al., 2009; Burke et al., 2005). Nursing students who reported accurate knowledge and positive attitudes towards EBP, gained from theoretical courses, were reported to find clinical application difficult (Jonsén et al., 2013).

Most nursing students and nurses in practice have reported that the problems most commonly encountered when gathering appropriate evidence for patient care are as follows: finding too much information; inability to recognize what is good information; and, 'busyness' (Dee & Stanley, 2005; Pravikoff et al., 2005).

Finding too much information and inability to discern the quality of information may be related to the lack of critical appraisal skills and advanced literature searching skills. Neither nursing students nor nurses reported using the help of a librarian to locate appropriate evidence (Carlock & Anderson, 2007; Pravikoff et al., 2005).

2.7.4. Other Health care students' knowledge of and attitudes towards EBP

A study conducted in the Netherlands reported a lack of knowledge and active behaviours with regard to EBM among physical therapy students. Those students ranked their knowledge from insufficient to average. This study reported weak positive attitudes among physical therapy students for participation in research activities. Textbooks and supervisors' opinions were the most commonly-used resources for evidence (Scholten-Peeters et al., 2013).

Positive attitudes and knowledge with regard to EBP were reported by the 86 Irish occupational therapy students who participated in a study. They all reported that they were willing to use EBP in their theoretical and practical work as students as well as in their future work as occupational therapists. More than half of the respondents reported accessing evidence every day or every other day. The Irish occupational therapy students reported using between 16-30 minutes to search for evidence every day (Stronge & Cahill, 2012).

Physiotherapy students at the University of South Australia reported improvements in EBP knowledge, skills, attitudes and behaviours as a result of participation in an EBP theory course and clinical integration of acquired skills (Long et al., 2011). A study involving athletic training students from the USA reported an improvement in knowledge of, and confidence in, EBP, after participation in theory and practical teaching activities (Manspeaker, Van Lunen, Turocy, Pribesh & Hankemeier, 2011).

2.7.5. Sources of Evidence

Kim et al. (2009) reported that textbooks were the sources of evidence most commonly-used by nursing students (84%) followed by Internet sources (77%) and finally medical professionals and educators (51%). These three sources of evidence have also been reported as the main sources in other studies involving nursing students and qualified nurses (Dee & Stanley, 2005; Estabrooks, Floyd, Scott-Findlay, O'Leary & Gushta, 2003; Pravikoff et al., 2005).

Surveys of nursing students and nurses in clinical practice found that Google and Google Scholar were the most often-used search engines in comparison to other databases such as CINAHL, PubMed or Cochrane (Dee & Stanley, 2005; Pravikoff et al., 2005). A study involving occupational therapy students found that the Internet and textbooks were the most commonly-used sources of evidence (Stronge & Cahill, 2012)

2.7.6. Barriers to EBP experienced by students

According to Pravikoff et al. (2005), nurses face many challenges when applying EBP in their daily practice; one of the main challenges is that research findings are generally not valued in practice. This challenge is an even bigger threat to nursing students who are willing to apply their freshly acquired knowledge into practice. It has been argued that nursing students struggle with adapting to clinical environments where nurses may not be aware or value the importance of EBP in a clinical setting (Martin, 2007). Nursing students also reported lack of time and knowledge as being obstacles to their utilization of EBP in clinical practice.

A survey was conducted, targeting 393 students enrolled in a BSc health studies programme who had just completed an EBP module; those students reported lack of time and unavailability of research reports as being barriers to a continuous application of EBP (Morris & Maynard, 2007).

Accessibility problems range from the limited supply of computers to the limited knowledge of how to use the computer or the available software (Martis, Ho, & Crowther, 2008).

Despite attending a research module, first-year Finnish and Swedish undergraduate nursing students reported that research-based implementation was difficult with no support from preceptors (Jonsen et al., 2013).

A lack of resources and lack of clinical instructor support and collaboration, with regard to applying EBP, were reported to be the most pertinent barriers to the application of EBP by athletic training students (Manspeaker et al., 2011). Occupational therapy students reported a lack of time, and lack of clinical examples and modelling from their clinical instructors as major barriers to the application of EBP (Stronge & Cahill, 2012).

Swedish nursing students reported less support in clinical settings compared to theoretical teaching research-based interventions. They perceived a gap between theoretical teaching and clinical teaching of EBP as being a barrier to clinical application of EBP (Jonsen et al., 2013).

2.7.7. A need for collaboration for effective application of EBP

Nurse educators have an opportunity to impact nursing students' perceptions and practice with regard to EBP, which will influence their current and future EBP practice. Nurse educators produce that impact by helping students to find and critique research studies, to compare the current clinical practice and best practice, and to address the identified gap in practice.

For this learning to take place, collaboration between librarians, nurse educators, clinicians and students is required (Odell & Barta, 2011). Collaboration between students and clinicians facilitates the process of teaching EBP in the academic setting and utilizing EBP in the clinical setting (de Cordova et al., 2008). Knowledge of basic research principles, ability to interpret research and critical analysis are required for application of evidence to practice; at the same time, gaining skills in EBP application requires practice (Fonteyn, 2005). Thus collaboration between experienced nurses and nursing students is a necessity.

Experienced nurses contribute through their long-term experience whereas nursing students contribute with new and updated knowledge which leads to a mutual learning (Ciliska, 2005). One challenge encountered in some contexts is a lack of effective techniques to facilitate a partnership between nurses, educators and clinicians to teach EBP skills (Fineout-Overholt & Johnston, 2005).

2.7.8. Role of information literacy skills

Information literacy is the doorway to EBP: it gives EBP users the ability to access, understand, and apply research findings. Although the nurses reported the Internet to be their most commonly-used source for evidence (Pravikoff et al., 2005), a study conducted in Southeast Asia concluded that nurses were less likely than other health care professionals to use the Internet for health information (Martis et al., 2008).

A study by McNeil et al. reported that most faculty members were novices or advanced beginners in using information technology (McNeil et al., 2003). Similarly Pravikoff et al. (2005) reported that 58% of the surveyed nurses had never used research reports, 82% had never used a hospital library, and 76% had never searched CINAHL.

There is a need for communication between librarians and education staff for the acquisition of both EBP skills and information literacy skills. Integration of information literacy in health professional curricula positively impacts evidence-based learning. Each of the five stages of the EBP process requires information literacy, particularly the second stage which involves literature search (Boruff & Thomas, 2011). Successful EBP teaching programmes in nursing have linked the role of librarians and information literacy skills to the acquisition of EBP skills and the development of evidence-based curricula (Klem & Weiss, 2005).

2.7.9. Barriers on the educator's side

Successful integration of EBP into health care professional curricula requires adequate knowledge, positive attitudes and daily application of EBP principles by academic health care professionals. In her study, Ciliska (2005, p. 346) identified a number of obstacles and opinions raised by nursing educators; thus, nurse educators considered EBP as “flavour of the month” that will quickly fade away. Therefore many of them preferred using recent evidence while teaching their subjects instead of teaching students the EBP process, and integrating EBP into their curricula.

They also reported lack of time to teach the EBP process as being another major obstacle. Some of them also reported that teaching EBP will be pointless when students carry out their clinical practice in environments where EBP is not applied.

A study was conducted in South Africa to assess knowledge of, and attitudes towards, EBP, using a sample of 23 academic health care practitioners. The following results were yielded: 80% of the practitioners strongly agreed to the need to integrate EBP into teaching but only 48% agreed that EBP is another perspective of clinical effectiveness. Regarding the use of EBP, 73.9% agreed that they used EBP in their teaching with 60.9% agreeing that EBP imposes more demands on their overloaded workloads.

More than half the sample reported to be using journals, textbooks, the Internet, colleagues, and the Cochrane library to improve their teaching (McInerney & Suleman, 2010). In this study, those academic health care practitioners attempting to integrate EBP into their teaching reported a number of obstacles, such as lack of knowledge pertaining to EBP, lack of access to research findings, insufficient evidence, and insufficient time (McInerney & Suleman, 2010). A similar study involving nurse practitioner educators identified resource-related barriers to teaching EBP: these included lack of time and money, traditional attitudes to teaching, and a focus in the teaching programme on generating evidence (Melnyk, Fineout-Overholt, Feinstein, Sadler, & Green-Hernandez, 2008).

2.8. EBP in developing countries

The application of EBP faces many barriers in developing countries, the main ones being constraints on human and financial resources, poor health systems, and lack of infrastructure. Although the use of updated guidelines and standards to inform practice is desired in developing countries, health care professionals are challenged by the lack of such guidelines or policies. The World Health Organization (WHO) has emphasised the need for the developing countries to focus on '*what works*' (Forland et al., 2013).

There is a call for developing countries to strengthen their health systems and in particular to bring existing evidence into practice (Siddiqi, Newell, & Robinson, 2005). Access to health care services applying EBP is a right for all people in all countries without any restriction; therefore, incorporating EBP in the African health care context is a necessity (Forland et al., 2013).

2.8.1. EBP initiatives in sub-Saharan Africa

In sub-Saharan Africa, a great need for EBP led to different initiatives, of which one is the 'Collaboration for Evidence Based Healthcare in Africa' (CEBHA) which includes eight Sub-Saharan countries: Ethiopia, Uganda, Rwanda, Burundi, Tanzania, Malawi, Zimbabwe and South Africa. CEBHA's main aim is to facilitate the integration of contextual best evidence in patient care, and to make evidence-based healthcare sustainable in Africa (Forland et al. 2013).

Among members of CEBHA, only South Africa has established centres for Evidence Based Health Care (EBHC): these are the South African Cochrane Centre and the Centre for EBHC at Stellenbosch University. CEBHA reported that EBHC capacity development programmes are only concentrated in South Africa and there is a need to expand these. In most of the country members there is a lack of such organized structures but countries are benefitting from some research initiatives and projects for EBHC and policy-making; for example SURE (Supporting the Use of Research Evidence for policy in African health systems) and REACH (Regional East African Community Health) (Forland et al., 2013).

These various initiatives struggle with multiple challenges, such as the lack of adequate information and communication technology equipment and human resources in health facilities. Health information systems are underdeveloped and there is a lack of coordinated structures for translation of health research findings into policy and practice. There is also a lack of understanding of the importance of EBHC among policy-makers and healthcare professionals while several guidelines lack background evidence.

Medical research is underdeveloped and not yet integrated into the medical culture, limiting options for disseminating research findings (Forland et al., 2013).

Most nursing schools in sub-Saharan Africa are still transitioning from traditional to more evidence-based curricula; such a shift implies that EBP is yet to become a strong pillar of the new curricula (Shaibu, 2006). This transition is challenged because of obstacles in the areas of human resources and finances; a lack of issues in these areas is a necessity for successful teaching and application of EBP (Shaibu, 2006).

2.9. Summary

If used effectively, EBP is believed to improve patients' outcomes and consequently health care outcomes (Dawes et al., 2005). EBP is not conceptually new as the concept was introduced in the 1970s; however, EBP started being actively used in medicine in the 1980s when it was known as EBM, and was subsequently expanded to other health care disciplines including nursing (Cullum et al., 2008; Shah & Chung, 2009). The EBP process was introduced as a framework to guide EBP users in different health care disciplines (Dawes et al., 2005). Nursing students need to be prepared adequately in order to use EBP as graduates; such preparation requires early and continuous integration of EBP into nursing curricula (Ciliska, 2005).

Nursing students indicated lack of time, knowledge, resources, and support from educators and clinical instructors as barriers to applying EBP (Martin, 2007). The most preferred sources of evidence among nursing students are Internet, textbooks and professionals' opinions (Kim et al., 2009). Nurse educators reported the main barriers to their application of EBP to be lack of time and knowledge (Ciliska, 2005). In sub-Saharan Africa, a lack of knowledge and resources constitute the main barriers to the clinical application and teaching of EBP (Forland et al., 2013; Shaibu, 2006). Despite these barriers, patients in sub-Saharan Africa have the right to access best care which should take into consideration whatever works for the region (Forland et al., 2013).

In Rwanda, the Department of Nursing at the University of Rwanda has a four-year Bachelor degree programme. The four-year nursing curriculum plan indicates EBP as being one of the main programme outcomes; however EBP is only allocated three hours of theoretical teaching input over the whole programme with no assessment. It is not certain whether this teaching input of EBP at the University of Rwanda prepares nursing students adequately for applying EBP.

CHAPTER 3: METHODOLOGY

3.1. Introduction

In this chapter the study design, setting, and population under study are presented. The data collection tool is described, and the validation thereof is explained. Data collection, data analysis and ethical considerations are described.

The aim of this study was to determine the self-perceived knowledge of, attitudes towards and application of EBP by third- and fourth-year undergraduate nursing students at the University of Rwanda. The study objectives were:

- To determine the self-perceived knowledge of third- and fourth-year undergraduate nursing students with respect to EBP.
- To determine third- and fourth-year nursing students' self-perceived attitudes towards EBP.
- To determine self-perceived application of EBP by third- and fourth-year nursing students.
- To compare third- and fourth-year students' self-reported knowledge, attitudes and application of EBP.

3.2. Study design

A quantitative research design was applied in the current study; this design consists of the scientific investigation of quantitative phenomena and their relationships (Polit & Beck, 2013). It is believed within the quantitative design tradition that variables in human behaviour can be studied objectively (Parahoo, 2006); this design was therefore appropriate for the current study. A non-experimental descriptive design was used to investigate the knowledge, attitudes and application of EBP by third- and fourth-year nursing students without manipulation of variables (Polit & Beck, 2013). A survey was conducted, which made use of self-administered written questionnaires.

3.3. Study Setting

The study was conducted at the University of Rwanda/College of Medicine and Health Sciences (former KHI) in Kigali, Rwanda.

The Department of Nursing falls under the School of Nursing and Midwifery. The Department of Nursing initially trained nurses at the advanced diploma level but the programme was converted to a Baccalaureate programme in 2006.

3.4. Study population

All third- and fourth-year undergraduate nursing students were eligible to participate in this study. In the year in which the study was conducted, there were 85 registered students in their third and fourth year (48 in third year; 37 in fourth year). Due to the accessibility and size of the study population, no sampling was done, and all student nurses in the third and fourth year of the programme who were willing to participate in the study were included.

3.4.1. Inclusion criteria

All third- and fourth-year undergraduate nursing students who were willing to participate in this study, and who had completed their second year of nursing training at the CMHS/UR were included in this study.

3.4.2. Exclusion criteria

Students who had completed their second year in other nursing schools were excluded from the study because of the probability that they may have had different levels of exposure to teaching on EBP.

3.5. Data collection

3.5.1. Instrument design

A knowledge, attitudes and behaviour (KAB) questionnaire for EBP was used to collect information in this study. This questionnaire was developed in 2003 by Johnston and colleagues for the purpose of assessing undergraduate EBP teaching and learning for medical students. It is a reliable and valid questionnaire that comprises 43 items with four subscales: EBP knowledge (five items), attitudes toward EBP (six items), use of EBP including personal application (six items), and future use of EBP (nine items) (Johnston, Leung, Fielding, Tin, & Ho, 2003, p. 995).

The remaining 17 items comprise questions relating to sources of evidence, time used to search for evidence, and reasons for not applying evidence (Appendix II).

A Likert scale is used for each subscale. A six-point scale ranging from strongly disagree (1) to strongly agree (6) is used for knowledge and attitudes. A five-point scale from 1 (never) to 5 (everyday) is used to rate the use of EBP. The future use of EBP is rated on a subscale from not at all (1) to completely (6) (Johnston et al., 2003; Kim et al., 2009; Stronge & Cahill, 2012). Permission to use the questionnaire was obtained from the authors (Appendix II). The questionnaire was in English, which is the teaching and learning medium at the UR/CMHS. In order to make the wording of the questionnaire relevant to nursing students in Rwanda, minor modifications were made to it (Appendix III). Those changes were mainly related to terminology; for example, evidence based medicine was replaced by evidence based practice.

3.5.2. Instrument Validity and Reliability

The validity of a questionnaire refers to the extent to which it measures what it is intended to measure whereas reliability implies stability and consistency of an instrument (Polit & Beck, 2013). The KAB questionnaire for EBP was developed from a comprehensive literature review, informed by international and local experts (Johnston et al., 2003, p. 997). The questionnaire was refined and validated according to the responses of a cohort of fifth-year medical students, and a combined group of second- and third-year students (Johnston et al., 2003). Construct validity of the questionnaire was tested by correlating the factors with other measures of EBP: the overall questionnaire as well as each factor was shown to have high construct validity (Cronbach's alpha >0.7 for each scale). Reliability was measured with a Cronbach's alpha of 0.71-0.88 demonstrating internal reliability. Responsiveness of the questionnaire was tested through paired t-tests of the pre-factor and the post-factor mean scores. Responsiveness was reported to be reliable and valid.

3.5.3. Validation for the current study

For the purpose of this study, content and face validity assessments were conducted to ensure the validity of the questionnaire in the Rwandan context. Two experienced assistant lecturers at the School of Nursing, University of Rwanda were requested to perform this task.

A content and face validity checklist adapted from Kyriacos (2011), with permission, was used to facilitate the validation process (Appendix VI).

Comments from the experts were considered and adjustments were made before commencing the pilot study. Further tests of reliability were not required as no major changes were made to the original questionnaire.

3.5.4. Summary of expert feedback

The overall content validity of the questionnaire was satisfactory. Minor changes were suggested for questions 22 and 42. Both experts proposed the addition of a simple definition of the expression “cook-book” used in question 22, and “procrastination” in question 42. Other sections were considered to be extremely relevant, by both experts. The two experts proposed that the layout and printing quality needed improvement, but no other suggestions for improvement were made. The suggestions were noted and the relevant changes were made. (Appendix V).

3.5.5. Pilot study

A pilot study was conducted and the voluntary respondents were eight graduates of the same Nursing School at the University of Rwanda, all of whom graduated in 2014. The academic exposure to EBP of these eight respondents was the same as the study participants’ exposure because both cohorts had been exposed to the same curriculum. As the questionnaire’s validity and reliability had been tested previously with satisfactory results (Johnston et al., 2003), the pilot study aimed to establish the validity of the questionnaire within the Rwandan context.

The respondents in the pilot study were asked to complete the questionnaire, and to provide information regarding the clarity of the questions, instructions and length of the questionnaire. For the purpose of maintaining confidentiality and restricting any influence on the main study responses, the number of recent graduates was equivalent to 10% of the study population. The voluntary respondents were conveniently recruited for the pilot study and were accessed in hospitals around Kigali city where they work. They were unlikely to have any contact with the study participants in the study period.

The information obtained from the pilot study facilitated the final implementation of the survey. For example, the time required to complete the questionnaire was determined by calculating the average time used to complete the questionnaire during the pilot study. The questionnaire completion time was determined to be approximately 20 to 30 minutes.

Pilot respondents reported that the questions were clearly worded and understandable. They also indicated that the questions were relevant to EBP and the Rwandan context.

The testers suggested that a brief definition of the word “cookbook,” as used in question 22, should be provided. This word was duly defined as suggested by the pilot respondents and the reviewers.

3.6. Data collection procedure

3.6.1. Gaining access

Permission to conduct the study was requested from the Human Research Ethics Committee at the Faculty of Health Sciences, University of Cape Town (UCT) (Appendix VI). Once this permission had been obtained, permission to conduct the research at the University of Rwanda was requested from the Directorate of Science, Technology and Research at the Rwandan Ministry of Education (Appendix VII). The college lecturers were informed about the study, but were not present during the actual data collection activity. Once the study was approved, invitations (Appendix VIII) to participate in the study with information relevant to the study and dates for data collection were sent to third-year and fourth-year students.

Data collection commenced after all the necessary approvals had been obtained (Appendix IX and X). Written informed consent was obtained from those respondents who agreed to participate (Appendix XI). Respondents were informed orally and in writing, that participation was voluntary. Moreover, they were informed that they had the right to refuse or withdraw from the study at any stage of data collection. Respondents were asked not to put their name or student number on the questionnaire for confidentiality and anonymity purposes. Respondents who consented to participate in the study were asked to separate the signed consent form from the completed questionnaire for confidentiality and anonymity. Arrangements were made with the head of the Nursing Department and lecturers to enter the two nursing classes (year 3 and year 4) at a time and date determined by the Department (after the final year exam). Questionnaires were hand-distributed to all respondents. A single numbered questionnaire was handed to each respondent to be completed individually. The researcher was assisted by two trained research assistants. All the questionnaires were distributed and returned on the same day. Minimal disruption was ensured, and students were relaxed because examinations had been completed.

As mentioned previously, the questionnaire required approximately 20 to 30 minutes to complete. Each respondent was instructed to place the completed questionnaire in an unmarked sealed envelope.

These envelopes were then placed in a sealed box, which was stationed in each class. The completed questionnaires were collected in person by the researcher.

3.7. Data management and analysis

3.7.1. Data management

Eighty-five (85) questionnaires were distributed, and 82 questionnaires were returned. The researcher counted and checked the questionnaires for completeness. No missing value was identified in the questionnaires. The coded data were transcribed onto an Excel spread sheet and double-checked by the researcher and the statistician for consistency, errors and outliers. The data set was backed up on the researcher's personal computer, and the completed questionnaires were stored in a lockable cabinet. Access to the data was limited to the researcher, the supervisors and the biostatistician to ensure confidentiality and anonymity.

3.7.2. Data analysis

The assistance of a statistician was sought for the data analysis. Data were analysed using SPSS version 22, and by means of descriptive statistics. Frequencies were calculated to determine the following: the respondents' levels of knowledge, attitudes, current and future application of EBP as well as the time used to look for evidence, sources of evidence, and reasons for not applying EBP. The frequency of a particular response to a question was calculated as a percentage and the data were illustrated using tables and bar charts. Knowledge, attitudes and application of EBP were cross tabulated with the year of study using the Chi-Square test. The significance level was set at $\alpha = 0.05$ and the confidence interval at 95%. Results from the analysed data are summarized and presented in the next chapter (Chapter 4: Data Analysis and Presentation of Results).

3.8. Ethical considerations

Permission to conduct the study was obtained from the Human Research Ethics Committee at the Faculty of Health Sciences, University of Cape Town (UCT), and from the Directorate of Science, Technology and Research at the Rwandan Ministry of Education.

The major ethical principles as recommended by Helsinki Declaration, World Medical Association were respected. These principles are respect for autonomy, confidentiality and beneficence /non-maleficence (World Medical Association, 2013).

3.8.1. Respect for autonomy

This ethical principle states that each individual's autonomy should be respected. Autonomy in research implies the right to decide about participation in a research study. The individual's right to autonomy was mentioned in the information letter as well as information about the aim and expected outcomes of the study (appendix II). Additional information was provided verbally before written consent was obtained. Participants were not coerced to participate in the study.

3.8.2. Confidentiality & Anonymity

Data were collected using anonymous coded self-administered questionnaires to protect the anonymity and privacy of participants. Data were protected with passwords, and kept securely. Data will be kept securely until the end of the study and for the prescribed period thereafter. After this period, it will be discarded.

3.8.3. Beneficence/non-maleficence

Strict confidentiality was assured for participants, who were also assured that participation or non-participation would not affect their studies in any way. Participants were assured that any information provided to the researcher would not be used against them.

3.8.4. Justice

Beauchamp and Childress (2013, p. 327) define justice as what is “fair, equitable appropriate treatment in light of what is due or owed to persons.” This principle dictates equal distribution of risks and benefits. There were no incentives involved in this study; however participants were treated equally and fairly.

3.8.5. Risks and benefits

There were no anticipated risks arising from participation in this study and there were no direct benefits to the participants. The possible benefit for future students is that the results may inform the curriculum planning for the nursing programme. No significant lecturing time was lost and so learning was not affected.

3.8.6. Vulnerability

In the context of students, the term ‘vulnerability’ is mostly related to academic, personal and financial pressures. The students were informed that they were free to participate or withdraw from the study without any negative consequences.

They participated freely without any form of coercion or manipulation in terms of incentives or pressure. In the event of any unexpected stresses, support was available.

3.9. Summary

A non-experimental quantitative, descriptive design was used in this study. Data were collected using a self-administered questionnaire. That questionnaire had been validated and pilot tested. Data were analysed by means of descriptive statistics. Ethical approval was obtained before commencing the study, and all ethical requirements were respected. The next chapter will provide a description of the data analysis and a detailed review of the results obtained.

CHAPTER 4: RESULTS

4.1. Introduction

This chapter presents a detailed description of the data analysis and the results. Descriptive analysis and cross tabulations are presented for all the sections. The response rate to the questionnaire was 96% with 82 questionnaires returned from 85 third- and fourth-year undergraduate nursing students at the College of Medicine and Health Sciences/University of Rwanda. Thirty-seven students (100% response rate) responded from the fourth year, and 45 students (93%) responded from the third year.

4.2. Self-reported knowledge of EBP

All five knowledge related questions (Questions 1 to 5) were answered by all the respondents. The respondents were given six options to indicate their knowledge regarding the EBP process. The options were 1= “Strongly disagree”; 2= “Moderately disagree”; 3= “Disagree”; 4= “Agree”; 5= “Moderately agree” 6= “Strongly agree”. Most respondents in both groups agreed with all the five steps of the EBP process with results ranging from 84% to 92%; it was therefore concluded that the respondents’ knowledge of EBP was adequate (See Table 2 below).

Table 2: Self-reported knowledge of EBP**(N=82)**

Knowledge related variables	Strongly disagree	Moderately disagree	Disagree	Agree	Moderately agree	Strongly agree	Total
I have a clear understanding of EBP	2(2%)	5(6%)	2(2%)	25(31%)	27(33%)	21(26%)	82(100%)
Research using clinical trials is generally more reliable than research using observational method	4(5%)	4(5%)	5(6%)	22(27%)	22(27%)	25(30%)	82(100%)
The evidence-based practice process requires the appropriate identification and formulation of clinical questions	1(1%)	0(0%)	7(9%)	21(26%)	30(36%)	23(28%)	82(100%)
Effective searching/easy access to bibliographic databases and evidence sources are essential to practicing evidence-based practice	1(1%)	2(2%)	4(5%)	14(17%)	26(32%)	35(43%)	82(100%)
Evidence-based practice requires the use of critical appraisal skills to ensure the quality of all research papers retrieved	0(0%)	2(2%)	7(9%)	20(24%)	24(29%)	29(36%)	82(100%)

Figure 1 represents a summary of EBP knowledge frequencies as reported by respondents from both groups. The number of respondents to this question was 82. Most respondents agreed with all the five statements of the EBP process.

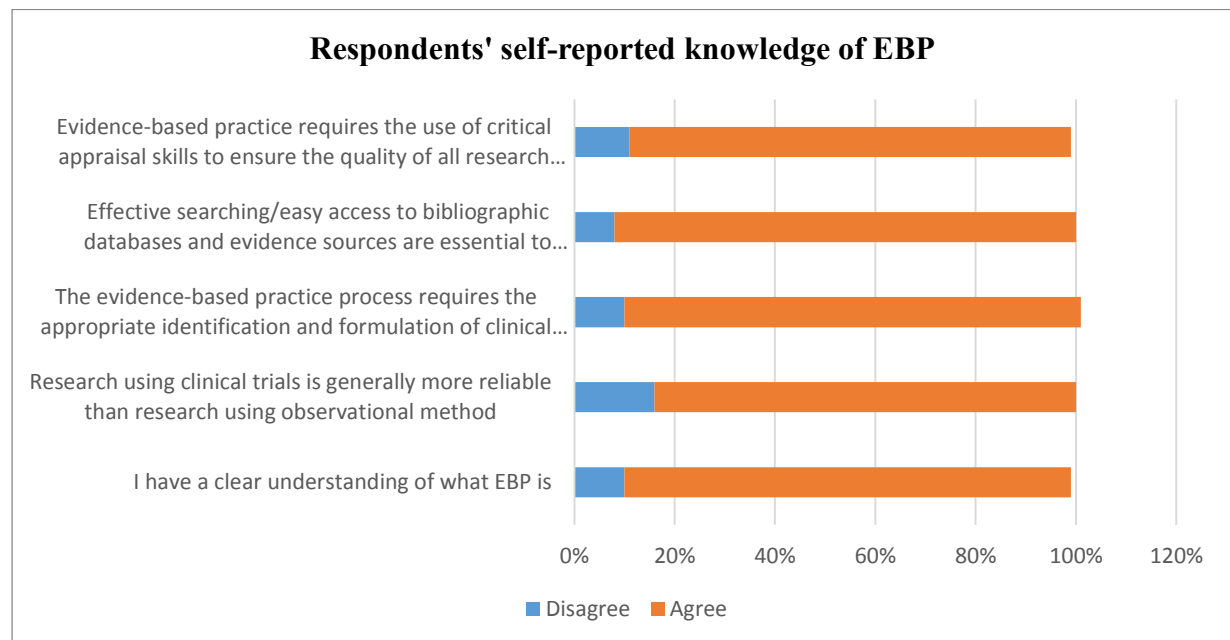


Figure 1: Respondents' self-reported knowledge of EBP (N=82)

4.3. Self-reported attitudes towards EBP

All attitudes-related questions (Questions 22, 23, 27, 28, 29 & 30) were answered by all respondents. The respondents were given six attitudes-related statements with six response options ranging from “Strongly disagree” to “Strongly agree” to indicate their attitudes towards EBP. Responses indicated both negative and positive attitudes. Most (63%) agreed that EBP is a cookbook or guidebook that disregards clinical experience; 56% agreed that if EBP is valid, then anyone can do what nurses do. Forty-nine per cent (49%) of the respondents agreed that previous work experience is more important than research findings. (See Table 3 below)

Table 3: Self-reported attitudes towards EBP**(N=82)**

Attitudes towards EBP	Strongly disagree	Moderately disagree	Disagree	Agree	Moderately agree	Strongly agree	Total
Evidence-based practice is ‘cook-book’(or ‘guidebook’) that disregards clinical experience	12(15%)	4(5%)	14(17%)	20(24%)	21(26%)	11(13%)	82(100%)
There is no reason for me personally to adopt EBP because it is just a ‘fad’(or ‘fashion’) that will pass with time	33(40%)	8(10%)	22(27%)	8(10%)	10(12%)	1(1%)	82(100%)
If EBP is valid, then anyone can see patients and do what nurses do	10(12%)	11(13%)	15(18%)	19(23%)	13(16%)	14(17%)	82(100%)
EBP ignores the ‘art’ of nursing	33(40%)	5(6%)	26(32%)	4(5%)	9(11%)	5(6%)	82(100%)
Nurses, in general, should not practice EBP because nursing is about people and patients, not statistics	34(41%)	6(7%)	21(26%)	12(15%)	8(10%)	1(1%)	82(100%)
Previous work experience is more important than research findings in choosing the best treatment available for a patient	14(17%)	10(12%)	18(22%)	17(21%)	14(17%)	9(11%)	82(100%)

Figure 2 represents a summary of EBP attitudes frequencies as reported by respondents in their third and fourth year of study. All 82 respondents answered this section of the questionnaire.

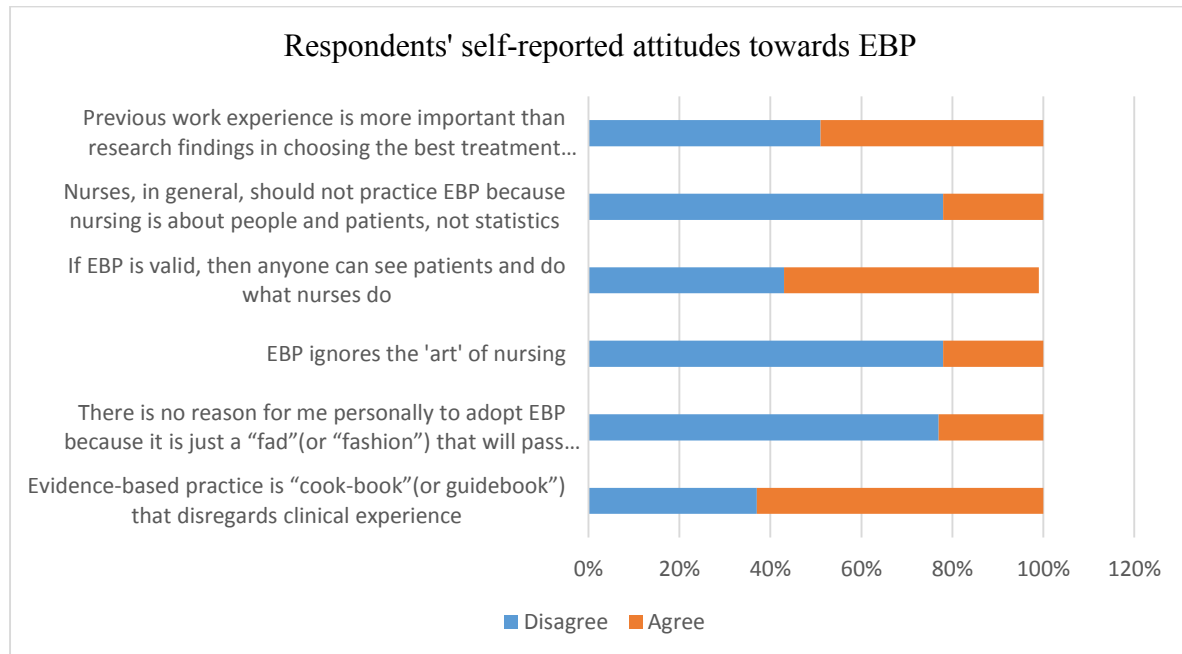


Figure 2: Respondents' self-reported attitudes towards EBP (N=82)

4.3.1. EBP in relation to time

All respondents provided answers to this question (Question 26). Most respondents (60%) agreed that EBP takes too much time from busy nursing students (see Figure 3 below). There was no association between this variable and the year of study. Figure 3 represents respondents' attitudes in relation to EBP and time.

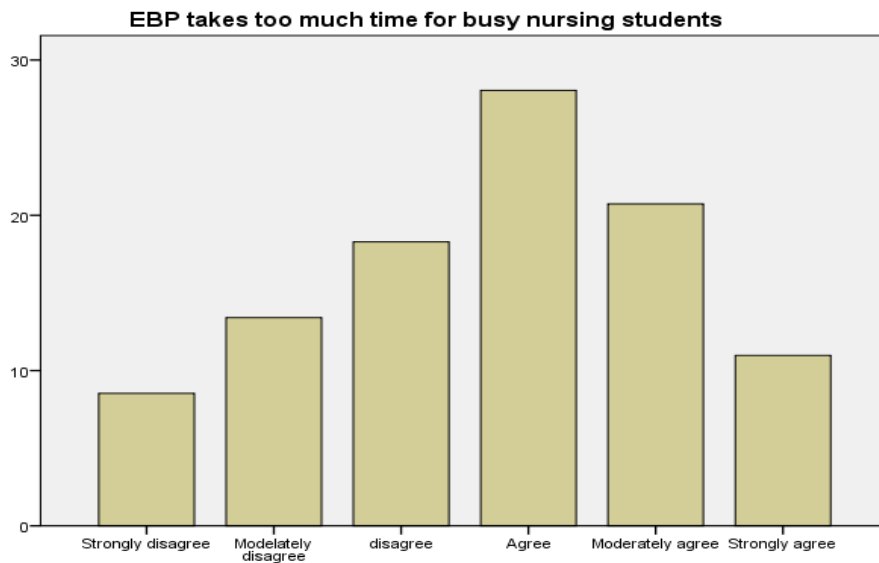


Figure 3: EBP takes too much time from busy nursing students (N=82)

4.3.2. Personal appreciation of EBP advantages

Respondents were asked to indicate whether they personally appreciate the advantages of EBP (Question 31). All responded to this question, with most (94%) indicating that they appreciate the advantages of EBP (See Table 4 below).

Table 4: Personal appreciation of EBP advantages

(N=82)

You personally appreciate the advantages of EBP	Frequency	Percent
Disagree	5	6
Agree	19	23
Moderately agree	19	23
Strongly agree	39	48
Total	82	100

4.3.3. EBP integration in the nursing curriculum

Respondents were asked whether EBP should be an integral part of the nursing curriculum (Question 32). All respondents answered this question and almost all (97%) agreed that EBP should be an integral part of the undergraduate nursing curriculum. (See Table 5 below)

Table 5: EBP integration in the nursing curriculum**(N=82)**

EBP should be an integral part of the Undergraduate nursing curriculum	Frequency	Percent
Moderately disagree	2	2
Disagree	1	1
Agree	16	20
Moderately agree	18	22
Strongly agree	45	55
Total	82	100

4.4. Self-reported application of EBP

4.4.1. EBP access

Most respondents reported accessing evidence weekly and monthly (Questions 6-11). Only ten respondents (12%) reported accessing evidence every day. Evidence was sourced primarily from the Internet and textbooks. The Cochrane database, MEDLINE and CINAHL were seldom accessed by the respondents. (Table 6 below).

Table 6: EBP access by third- and fourth-year nursing students**(N=82)**

Access to EBP by respondents	Never	Every month	Every week	Every other day	Every day	Total
How frequently do you access research evidence in general?	14(17%)	26(32%)	17(21%)	15(18%)	10(12%)	82(100%)
How frequently do you access research evidence via the Internet?	6(7%)	15(18%)	22(27%)	31(38%)	8(10%)	82(100%)
How frequently do you access research evidence from a textbook?	14(17%)	30(37%)	14(17%)	20(24%)	4(5%)	82(100%)
How frequently do you access research evidence from original research papers?	36(44%)	21(26%)	13(16%)	11(13%)	1(1%)	82(100%)
How frequently do you access research evidence from the Cochrane database?	59(72%)	8(10%)	4(5%)	9(11%)	2(2%)	82(100%)
How frequently do you access research evidence from MEDLINE and CINAHL?	38(46%)	17(21%)	11(13%)	13(16%)	3(4%)	82(100%)

Figure 4 summarizes EBP access by third- and fourth-year nursing students. Respondents were given six questions related to EBP access with five response options to indicate their EBP access frequency. Response options were “Never;” “Every month;” “Every week;” “Every other day” and “Every day.”

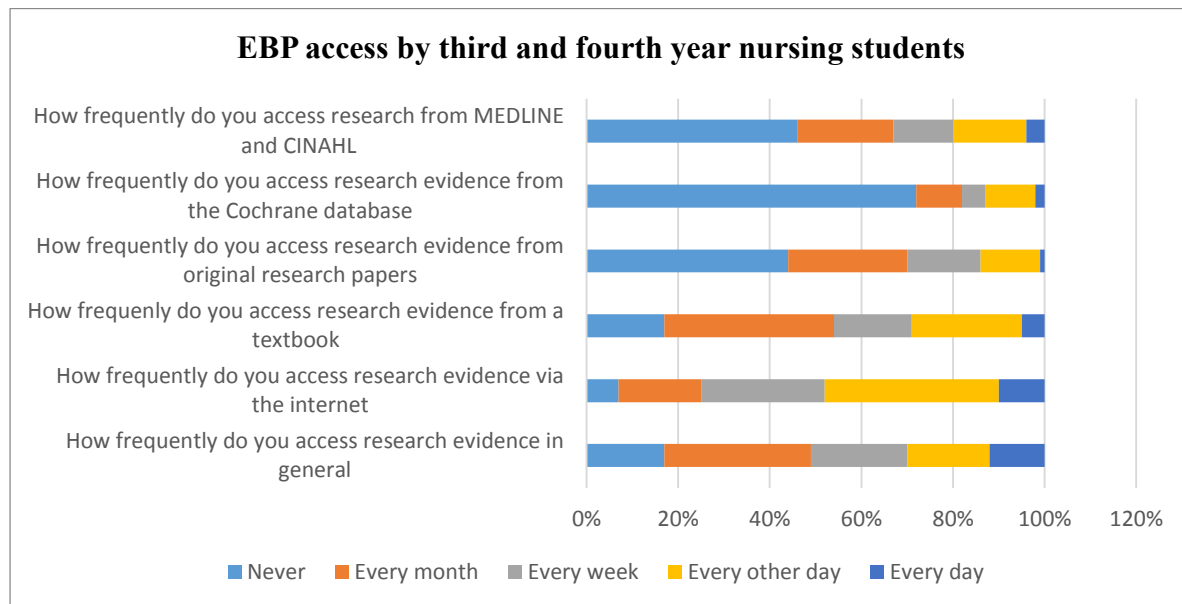


Figure 4: EBP access by third- and fourth-year nursing students (N=82)

4.4.2. Time spent searching for evidence every day

All respondents reported on the amount of time they spend searching for evidence every day (Question 12). Respondents were given three options: “0-30 minutes;” “31-60 minutes” and “over 60 minutes”. Most respondents reported spending between 0 - 30 minutes searching for evidence. There was no association between time spent searching for evidence and the year of study (See Table 7 below).

Table 7: Time spent searching for evidence

(N=82)

Time spent finding or looking up for evidence	Frequency	Percent
0-30 minutes	60	73
31-60 minutes	12	15
Over 60 minutes	10	12
Total	82	100

4.4.3. Sources of evidence

All respondents answered this question (Question 33). The Internet, textbooks, original research papers, the Cochrane database, MEDLINE and CINAHL were the five response options. The most utilized source of evidence was the Internet, followed by textbooks. Original research papers, the Cochrane database, Medline and CINAHL are the least used. (See Figure 5)

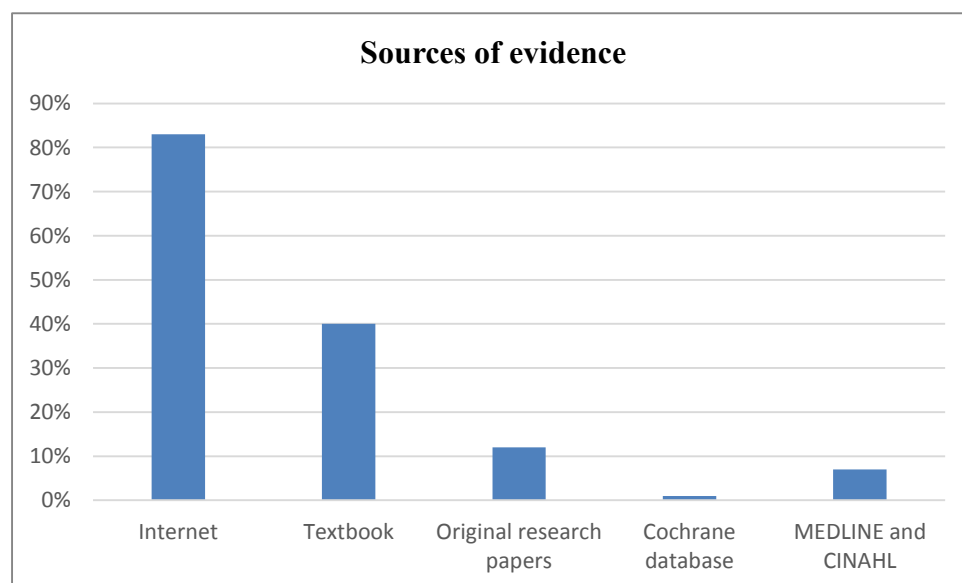


Figure 5: Sources of evidence (N=82)

4.4.3.1. Raising the role of current best evidence in clinical practice

Respondents were given six response options to indicate how they have raised the role of best evidence with their peers or other clinicians in their clinical practice (Question 16). The options were “Never;” “Rarely;” “Occasionally;” “Sometimes;” “Often” and “All the time.” All respondents attempted to answer this question and most of them reported that they have sometimes raised the role of EBP at clinical rounds, and clinical instruction sessions. (See Table 8 below).

Table 8: Role of current evidence during clinical rounds/sessions

(N=82)

How frequently have you raised the role of current best evidence during clinical rounds/sessions	Frequency	Percent
Never	4	5
Rarely	5	6
Occasionally	17	21
Sometimes	29	35
Often	22	27
All the time	5	6
Total	82	100

4.4.4. Self-reported EBP practice

Respondents were given two options namely “Yes” or “No” to indicate whether they considered themselves to be EBP practitioners or not (Question 36). All respondents answered this question and most of them reported that they considered themselves to be EBP practitioners (73%). Most respondents reported that they face obstacles in the implementation of EBP (See Table 9 below).

Table 9: Self-reported EBP practice

(N=82)

Do you consider yourself a	Frequency	Percent
Practitioner of EBP currently?		
Yes	60	73
No	22	27
Total	82	100

4.4.5. Reasons for not applying/practicing EBP

The three main responses to this question were: (1) lack of knowledge, (2) lack of time, and (3) lack of support from lectures, clinical instructors, and qualified nurses who do not set examples (Questions 37-43). Figure 7 illustrates the frequency of the various reasons cited for not applying EBP.

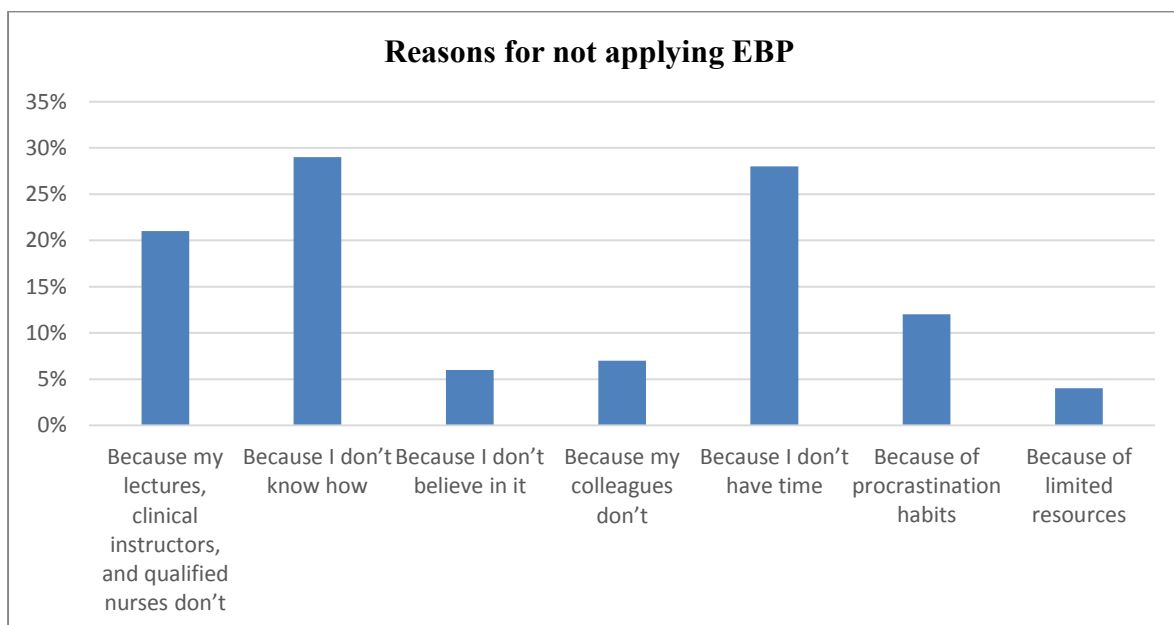


Figure 6: Reasons for not applying EBP (N=82)

4.4.6. Future Use of EBP

4.4.6.1. Usefulness of EBP

Respondents were asked to rate the usefulness of EBP in their future practice (Question 20). All respondents answered this question and the response options were “Not useful,” “Useful,” “Somewhat useful,” or “Very useful.” Almost all respondents believed that EBP will be useful in their practice as nurses. (See Table 10 below).

Table 10: Usefulness of EBP in future practice

(N=82)

How useful do you believe EBP will be in your future practice as a nurse?	Frequency	Percent
Not useful	2	2
Useful	12	15
Somewhat useful	16	20
Very useful	52	63
Total	82	100

4.4.6.2. EBP in the future of clinical nursing.

Respondents were asked their views about the place of EBP in clinical nursing (Question 24). All respondents answered this question by agreeing that EBP is the future of clinical nursing and will become the standard of care (See Table 11 below).

Table 11: EBP in the future of clinical nursing.**(N=82)**

EBP is the future of clinical nursing and will become the standard of care	Frequency	Percent
Agree	17	21
Moderately agree	20	24
Strongly agree	45	55
Total	82	100

4.4.6.3.Willingness to practice EBP in the future

Almost all respondents were willing to practice EBP as nurses in the future (Question 21).
(See Table 12 below).

Table 12: Willingness to practice EBP in the future**(N=82)**

How willing are you to practice EBP as a nurse in the future	Frequency	Percent
Moderately unwilling	1	1
Unwilling	1	1
Willing	13	16
Moderately willing	18	22
Very willing	49	60
Total	82	100

4.4.6.4. Preferred sources of evidence

Most respondents preferred to access evidence from a library (Question 34). There was a significant preference for the use of mobile or handheld computers rather using a desktop computer in the patient care environment (See Figure 8 below)

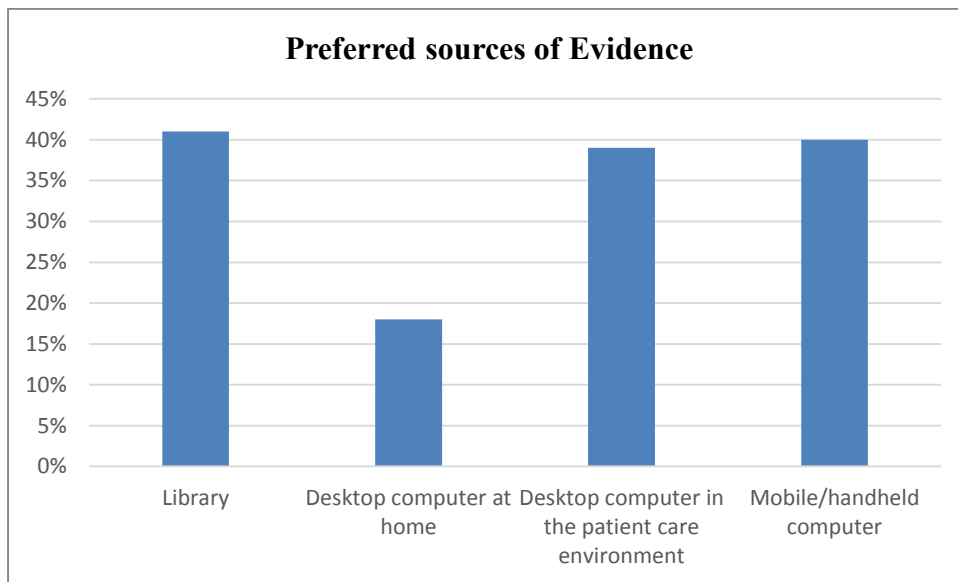


Figure 7 : Preferred sources of evidence (N=82)

4.5. Comparison between year of study and knowledge of and attitudes towards EBP

4.5.1. Cross tabulation between self-reported knowledge and year of study

Cross tabulation between self-reported knowledge and year of study indicated a relationship between two knowledge related variables and the year of study. There was a positive association with a statistically significant p value 0.035 (less than 0.05) between the variable “Research using clinical trials is more reliable than research using observation” and the year of study. Similarly, the variable “Effective searching skills/Easy access to bibliographic databases and evidence sources are essential to practicing evidence-based practice” was associated with the year of study with a p value of 0.012. More respondents in year four of their study strongly agreed with both statements, in contrast to the respondents in their third year.

Seventeen respondents (46%) in their fourth year strongly agreed that research using clinical trials is more reliable than observation methods while only eight (10%) respondents in third year strongly agreed with this statement.

Similarly, twenty-four respondents (65%) in fourth year strongly agreed that effective searching skills/easy access to bibliographic databases and evidence sources are essential to practicing evidence based practice while only eleven (24%) respondents in third year strongly agreed with this statement (See Table 13). There was no relationship between other knowledge related variables and the year of study.

Table 13: Cross tabulation between self-reported knowledge and year of study

Knowledge related variables	Tests	Value	df	Asymp. Sig. (2-sided)
Research using clinical trials is generally more reliable than research using observational methods	Pearson Chi-Square	11.955 ^a	5	.035
Effective searching/easy access to bibliographic databases and evidence sources are essential to practicing evidence-based practice	Pearson Chi-Square	14.605 ^a	5	.012

4.5.3. Cross tabulation between Attitudes towards EBP and year of study

The only attitudinal variable that was associated with the year of study was a statement stating that EBP ignores the art of nursing: a statistically significant p value of 0.03 (less than 0.05) was found. More respondents in fourth year disagreed with this statement when compared with respondents in year three (See Table 14). There was no relationship between other attitudinal variables and the year of study.

Table 14: Cross tabulation between Attitudes towards EBP and year of study

Attitudinal variables	Tests	Value	df	Asymp. Sig. (2-sided)
EBP ignores the “art” of nursing	Pearson Chi-Square	11.938 ^a	5	.036

4.5.4. Cross tabulation between application of EBP and year of study

There was no relationship between EBP access and application variables and the year of study.

4.6. Summary

Almost all (96%) third-year and fourth-year nursing students responded to all the sections of questionnaire. The section dealing with EBP knowledge yielded positive results with most participants agreeing to all the steps of the EBP process: positive responses to the five knowledge related questions ranged from 84 to 92%. Two knowledge related variables were associated with the year of study with statistically significant p values of 0.03 and 0.01. Two of the six attitudinal variables scored negative; no relationship between respondents' attitudes and the year of study was noted. Only 12% (n=10) respondents reported accessing evidence every day.

Most (83%) respondents reported using the Internet as their primary source of evidence, with limited use of Cochrane (1%), Medline and CINAHL (6%). Respondents indicated lack of knowledge (29%), lack of time (28%), and lack of examples or role modelling from lecturers, clinical instructors and nurses (21%) as the most prevailing barriers to their application of EBP. Preferred sources of evidence were a library (41%), mobile/ handheld computer (40%), and a computer in a patient care environment (39%).

CHAPTER 5: DISCUSSION, RECOMMENDATIONS, LIMITATIONS, AND CONCLUSION

Introduction

In this chapter the results presented in chapter four are discussed. Recommendations for future research are described and limitations of the study are identified. The discussion of results is based on the aim and objectives of the study.

The aim of this study was to determine self-perceived knowledge of, attitudes towards and application of EBP by third- and fourth-year undergraduate nursing students at the University of Rwanda. The objectives of the study were:

- To determine the self-perceived knowledge of third- and fourth-year undergraduate nursing students with respect to EBP.
- To determine the self-perceived attitudes of third- and fourth-year nursing students towards EBP.
- To determine the self-perceived levels of application of EBP by third- and fourth-year nursing students.
- To compare third- and fourth-year students with respect to their self-reported knowledge of, attitudes towards and application of EBP.

5.1. Discussion

5.1.1. Self-reported knowledge of evidence-based practice

The successful application of EBP requires knowledge and skills to develop appropriate research questions, search and then conduct a critical appraisal of relevant literature and evaluate the transferability of research evidence to clinical practice (Fineout-Overholt & Johnston, 2005). The results presented in this study indicate that most third- and fourth-year nursing students at the University of Rwanda were knowledgeable about the five steps of the EBP process; 90% indicated that they had a clear understanding of EBP and 84% agreed that research using clinical trials is more reliable than research using an observational method.

Strong support (90% of respondents) was found in respect of the need for appropriate identification and formulation of clinical questions for EBP. The importance of easy access to bibliographic databases and evidence sources for effective application of EBP was also strongly supported (92%). Respondents supported (89%) the importance of critical thinking skills in evaluating the quality of research papers. These results concur with results from a previous study conducted in Ireland by Stronge & Cahill (2012) with a similar data collection tool (questionnaire). That study was conducted to determine the knowledge, attitudes and behaviours of final-year occupational therapy students towards EBP with a response rate of 77% (n=86). All the participants in this study agreed that they had a clear understanding of EBP, and most (72%) agreed that clinical trials were more reliable than observation methods. Most respondents (94%) agreed that identification and formulation of a clinical question is required in the EBP process, and almost all respondents (99%) agreed that effective searching skills and access to databases and sources of evidence was necessary for effective application of EBP. The need for appraisal skills to evaluate the quality of research papers was highly acknowledged by most respondents (97%). All respondents agreed that EBP application involved clinical judgement, clinical experience and evidence (Stronge & Cahill, 2012).

The findings in both the Rwandan and Irish studies suggest that students were knowledgeable about the EBP process. Knowledge of EBP is the initial step towards developing positive attitudes towards it, and applying EBP in clinical practice. However, mere theoretical knowledge may not trigger positive attitudes or increase application in practice (Ciliska, 2005; Dawes et al., 2005).

5.1.1.1.Relationship between Knowledge of EBP and year of study

The results obtained in this study indicated a relationship between two knowledge related variables and the year of study. Variables that had a relationship with the year of study were closely linked to the nature of research studies used in EBP: (a) research using clinical trials is more reliable than the observation method and (b) easy access to bibliographic databases and evidence sources is essential for practicing EBP. Comparison of those variables with the year of study indicated statistically significant p values of 0.03 and 0.01 (less than 0.05). A similar relationship was revealed by another study involving nurses in clinical practice. Thus, Brown et al. (2009) reported that a nurse's knowledge of EBP increased with their academic qualification. The finding that fourth-year nursing students responded more positively than third-year students to these questions may be attributed to their greater exposure to research.

Fourth-year nursing students at the University of Rwanda are expected to complete a minor research project that entails reviewing literature, collecting data, and reporting. It is argued that nurses who are exposed to a research exercise as part of their university education are more likely to have more knowledge and positive attitudes towards EBP, when compared to students without such exposure (Veeramah, 2004). Research knowledge may, however, not provide students with sufficient background to develop EBP skills (Ciliska, 2005). A lack of knowledge and skills to evaluate and use research findings was identified as one of the barriers to the use of EBP; therefore, studies recommended educating nurses in research and critical appraisal of scientific journals (Egerod & Hansen, 2005; Pravikoff et al., 2005; Thompson et al., 2007).

5.1.2. Self-reported attitudes towards EBP

Two of the six attitudinal variables scored negative, with no significant differences evident between the attitudes of the third-year and fourth-year students. Similar results were reported in a Saudi Arabian study involving final-year dental and medical students. With a response rate of 74%, Saudi Arabian students' attitudes were graded as negative with no significant difference between dental and medical students (Bahammam & Linjawi, 2014). Most of the respondents from the University of Rwanda agreed that EBP is a 'cookbook' or 'guidebook' which disregards clinical experience. A critique of EBP is that it has been portrayed as a 'cookbook' with no consideration of the practitioner's judgment. Thus, EBP protocols and guidelines have been compared with recipes, taking no account of either the practitioner's experience or the uniqueness of every patient (Mullen & Streiner, 2004; Straus & McAlister, 2000). This argument has, however, been refuted with the argument that the definition of EBP includes "*clinical expertise*" as part of evidence. It has been argued that clinical expertise involves the clinician's past experience which is directly linked to the context (Straus et al., 2011). More than half of the respondents from the University of Rwanda (56%) agreed that anyone can do what nurses do if EBP is valid, and almost half of the respondents in this study agreed that previous work experience is more important than research findings. However, in contrast with the views of nursing students at the University of Rwanda, Irish occupational therapists did not consider EBP to be a cookbook, and almost all them disagreed with the argument that EBP is just a fashion that will pass with time (Stronge & Cahill, 2012).

Although nursing students at the University of Rwanda reported positive knowledge of EBP, They reported some negative attitudes towards EBP. Studies have reported that attitudes towards EBP tend to vary; attitudes become more positive with increasing knowledge and skills of EBP and research and in the presence of a culture supporting and encouraging the application of EBP. A lack of critical appraisal skills and lack of skills in conducting an advanced literature search may trigger negative attitudes towards EBP (Brown et al., 2009; Burke et al., 2005). Negative attitudes towards EBP among nursing students at the University of Rwanda may be associated with a lack of practical knowledge of EBP, not just mere theoretical knowledge. These findings highlight the need to translate EBP knowledge into practice through a continuous and guided EBP learning process in both the clinical and classroom settings (Ciliska, 2005; Finotto et al., 2013).

More than half (60%) of the nursing students at the University of Rwanda agreed that EBP requires too much time from busy nursing students. This concurs with the findings of other studies, in which most nursing students and clinicians have reported lack of time or ‘busyness’ as the most-frequently encountered problems when gathering appropriate evidence for patient care (Dee & Stanley, 2005; Pravikoff et al., 2005). Almost all students at the University of Rwanda agreed that EBP should be an integral part of the nursing curriculum. This is in line with recommendations from literature suggesting EBP integration in health professionals’ curricula across different levels with related assessment methods (Ciliska, 2005; Dawes et al., 2005).

5.1.3. Current and future application/use of Evidence-Based Practice

Literature suggests that students who are encouraged to apply EBP during the early stages of training are most likely to continue learning and applying EBP after they graduate (Eddy, 2005). Health care professionals are expected to search for current or most recent evidence prior to all clinical decision making. Such evidence is sometimes summarized in the form of protocols or reviews which makes it easily and quickly understandable. When evidence is not summarized, it takes more time to understand and then summarize for direct use (Fineout-Overholt & Johnston, 2005; Straus et al., 2011).

Nursing students at the University of Rwanda reported a low frequency of access to, and application of, EBP. Few students (12%) from the University of Rwanda reported accessing evidence every day; most students reported accessing evidence monthly or weekly while

some students (17%) reported never searching for evidence. In response to the question on time spent searching for evidence every day, most respondents (73%) in the current study reported using less than 30 minutes for this purpose every day. A similar study conducted by Stronge and Cahill (2012) reported a lot higher frequency and duration of access of EBP: in that study more than half of the participants accessed evidence every day or every other day, and a third reported spending more than an hour looking for evidence .

Reliable evidence is classified in different categories ranging from meta-analysis, randomized controlled trials to single descriptive or qualitative studies. The most reliable sources for such evidence are databases such as the Cochrane library, Medline, CINAHL, Up-to-date and others (Fineout-Overholt & Johnston, 2005). The sources of evidence used most frequently by nursing students at the University of Rwanda were the Internet followed by textbooks and original research papers; however, the Cochrane database, Medline and CINAHL were rarely used. It can therefore be concluded that nursing students at the University of Rwanda do not often use the most reliable sources to access evidence. These findings concur with those of Kim and colleagues, who reported that textbooks were the sources of evidence most used by nursing students (84%) followed by the Internet (77%) (Kim et al., 2009). Other studies involving nursing students and clinical nurses have reported that textbooks, the Internet and research papers are the main sources of evidence used (Dee & Stanley, 2005; Estabrooks et al., 2003; Pravikoff et al., 2005). Google and Google Scholar search engines were used more frequently by nursing students and clinical nurses, in comparison to other reliable sources of evidence such as Cochrane, PubMed, and CINAHL (Dee & Stanley, 2005; Pravikoff et al., 2005).

Most respondents in the current study (73%) considered themselves to be EBP practitioners, but reported varying levels of application. Reasons given by University of Rwanda nursing students for not applying EBP include the following: a lack of support and example from lecturers, clinical instructors and qualified nurses (21%); lack of knowledge (29%), lack of time (28%); procrastination habits (12%), lack of faith in EBP (6%) and lack of resources (4%).

The paucity of role models has been reported previously as a barrier to the application of EBP. Martin (2007) has argued that nursing students struggle with adapting to clinical environments in which professional nurses may not be aware of or value the importance of EBP in a clinical setting.

Nurse educators are called upon to replace traditional didactic teaching methods with innovative teaching strategies that increase students' EBP knowledge and skills (Kim et al., 2009). Nurse educators have a unique opportunity to influence nursing students' perceptions and practice with regard to EBP, which in turn impacts current and future EBP practice. Nurse educators attain this objective by helping students to find and critique research studies, to compare the current clinical practice and best practice, and to develop then address the identified gap in practice. For this learning to take place, collaboration between librarians, nurse educators, clinicians and students is required (Odell & Barta, 2011).

In similar studies, nursing students have reported lack of time and knowledge as being obstacles to the utilization of EBP in clinical practice. In a survey involving students, Morris and Maynard (2007) reported lack of time and unavailability of relevant research reports as obstacles. Accessibility problems have been reported, ranging from the limited supply of computers to limited knowledge of how to use the computer or the available software (Martis et al., 2008). Information literacy is the doorway to EBP, it facilitates the ability to access, understand, and apply research findings. A study conducted in Southeast Asia concluded that nurses were less likely than other health care professionals to use the Internet for health information (Martis et al., 2008). Nursing students (29%) taking part in the current study reported that they do not apply EBP because they do not know how to apply it. This response highlights a possibility that nursing students at the University of Rwanda do not receive enough guidance about how to put evidence into practice or to the fact that they do not know how to access evidence which involves the use of information literacy. Nursing students at the University of Rwanda are not taught, as part of their curriculum, how to use information literacy to access evidence. Almost 98% of the students were willing to apply EBP in the future; similarly 98% reported that EBP will be useful in their future practice as nurses.

5.2. Recommendations

A number of recommendations are presented and these arise from the findings of this study. Recommendations are made pertaining to specific domains of nursing: nursing education, nursing education management and research.

5.2.1. Recommendations for Nursing Education

- EBP tuition in the Department of Nursing at the University of Rwanda is allocated three hours over the four-year programme.

This theoretical teaching input is not sufficient to help students to develop positive attitudes towards EBP and to apply EBP in clinical settings. EBP should be an integral part of the nursing curriculum throughout the four-year programme with emphasis on both theory and practice.

- Practical application of EBP should be included in clinical teaching and in assessment. This would facilitate the students' engagement with accessing appropriate information, implementation and evaluation of an EBP intervention.
- The teaching input of EBP at the University of Rwanda is not assessed formally at present, which may influence students' perceptions of its importance; this in turn could minimize the value of EBP for effective health care and limit application of EBP. Evidence-based teaching of theoretical and practical inputs should be formally assessed at the appropriate stages of the nursing degree programme.

5.2.2. Nursing education management

- The time needed to search for evidence is an important issue in ensuring effective EBP. As practitioners become more skilled at searching, they should need less time to access the evidence required for an intervention. It is therefore important for students to learn and practice such skills during their training, so they can access evidence quickly and efficiently as professional nurses.
- Accessing best evidence requires access to resources: the minimum level of resources comprises a library with updated materials, payment of registration fees allowing access to databases known to be the best sources of evidence, and a computer with reliable Internet connectivity. These minimum resources are not affordable for most students at the University of Rwanda. It is therefore important for the University to provide these essential resources so the students can access the most current evidence.
- Nurse educators and clinical instructors are considered to be the most important role models for their students. Nursing students rely on guidance, support and good examples from their educators or clinical instructors in practicing EBP. EBP may however be a new or unfamiliar concept to many nursing educators and clinical instructors. The University therefore needs to ensure learning opportunities.
- Teaching nursing students in clinical settings is a joint effort between nurse educators, clinical instructors and nurses. Education managers should collaborate with clinical managers to promote EBP application policies in clinical settings.

- Evidence seminars and journal clubs should be initiated because these play an important role in increasing levels of EBP knowledge and EBP application.

5.2.3. Further research

- Nurse educators and clinical instructors play an important role in teaching EBP and in ensuring its application. A lack of support from clinical instructors may impose an enormous barrier against the application of EBP. It is not known whether educators and clinical instructors at the University of Rwanda are knowledgeable about, and have positive attitudes towards EBP, in order to support their students. Further studies are needed to assess nurse educators' and clinical instructors' knowledge of, attitudes towards, and application of EBP.
- The Department of Nursing at the University of Rwanda is the main department of nursing in Rwanda. The University of Rwanda also offers other nursing and midwifery programmes at advanced diploma and degree level. There are also some private nursing undergraduate programmes on offer in Rwanda. Future research should include a sample of nursing schools to provide generalizable results.
- Students reported a mobile or handheld device to be one of their preferred sources of evidence. Future research should assess the feasibility of using mobile applications that would help students to access evidence easily and quickly.
- The observation research method is known to be an effective method to assess the clinical application of a technique or a skill set. Observation studies should be conducted in clinical settings to assess, effectively, the application of EBP.

5.3. Strengths and Limitations of the study

- The findings from this study are similar to those of other studies, making it possible to draw recommendations from previous studies and then to apply or adapt these to the Rwandan context.
- This is the first study of its kind in Rwanda. It should therefore inform education, practice and further studies.
- The response rate was high, making results meaningful within the research settings.

- The study was limited to one nursing school in Kigali and so the findings cannot be generalized.

5.4. Conclusion

The aim of this study was to determine the self-perceived knowledge of, attitudes towards, and application of EBP by third- and fourth-year undergraduate nursing students at the University of Rwanda. The results indicated that most third- and fourth-year nursing students at that University were knowledgeable about EBP. One could argue that nursing students scored high on the knowledge sub-scale because the teaching input of EBP at the University is only theoretical.

There was an association between two research related variables and the year of study with higher scores from students in fourth year. This association can be explained by the fact that fourth-year nursing students were working on a traditional research project as a requirement for graduation. They were therefore more acquainted with research than third-year students.

The study found that some of the students' attitudes were negative. The discrepancy between knowledge about and attitudes towards EBP can be attributed to the lack of connection between EBP, theoretical knowledge and the actual practice. Theoretical knowledge, in isolation, is not enough to encourage positive attitudes.

It was also found that EBP access and application were limited. This result was to be expected, if one bears in mind the limited and basic amount of theoretical teaching of EBP with no practical guidance, evaluation. Most nursing students reported using the Internet as their primary source of evidence, with limited use of best evidence databases such Cochrane and Medline.

The most common barriers to the implementation of EBP were lack of knowledge, lack of time, and the lack of positive examples or role modelling from lecturers, clinical instructors and nurses. EBP teaching at the University of Rwanda needs to be an integral part of the nursing curriculum throughout the four-year programme with emphasis on both theory and practice.

The role of nurse educators and clinical instructors in teaching EBP is critical: a lack of support from clinical instructors may constitute a very large barrier to the application of EBP.

It is not known whether educators and clinical instructors at the University of Rwanda are knowledgeable about and have positive attitudes towards EBP, in order to support their students. Further studies should be conducted to assess nurse educators' and clinical instructors' knowledge of, attitudes towards, and application of EBP.

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APPENDICES

I. Search strategies

PUBMED	CINAHL via EBSCO HOST	SCOPUS	AFRICA-WIDE INFORMATION
<p>Search one</p> <p>keywords (((knowledge OR awareness)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices) </p> <p>Inclusion criteria Publication dates 10 years Language: English </p> <p>Obtained articles: 307 </p> <p>Retained articles: 26</p>	<p>Search one</p> <p>Keywords (((knowledge OR awareness)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices) </p> <p>Inclusion criteria Publication dates 2004-2015 Language: English </p> <p>Obtained articles: 246 </p> <p>Retained articles: 10</p>	<p>Search one</p> <p>(TITLE-ABS-KEY (knowledge OR awareness) AND TITLE-ABS-KEY (evidence based practice OR evidence based nursing) AND TITLE-ABS-KEY (nursing students OR apprentices)) </p> <p>Inclusion criteria Publication dates 2004-2015 Language: English </p> <p>Obtained articles: 388 </p> <p>Retained articles: 3</p>	<p>Search one</p> <p>Keywords (((knowledge OR awareness)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices) </p> <p>Inclusion criteria Publication dates 2004-2015 Language: English </p> <p>Obtained articles: 4 </p> <p>Relevant articles: 1</p>

<p>Search two</p> <p>Keywords: (((attitudes OR beliefs)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices)</p> <p>↓</p> <p>Inclusion criteria:</p> <p>Publication dates: 10 years</p> <p>Language English</p> <p>↓</p> <p>Obtained articles: 299</p> <p>↓</p> <p>Relevant articles:27</p> <p>↓</p>	<p>Search two</p> <p>Keywords: (((attitudes OR beliefs)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices)</p> <p>↓</p> <p>Inclusion criteria:</p> <p>Publication dates: 2004- 2015</p> <p>Language English</p> <p>↓</p> <p>Obtained articles: 219</p> <p>↓</p> <p>New retained articles: 3</p>	<p>Search two</p> <p>(TITLE-ABS-KEY (attitudes OR beliefs) AND TITLE-ABS-KEY (evidence based practice OR evidence based nursing) AND TITLE-ABS-KEY (nursing students OR apprentices))</p> <p>↓</p> <p>Obtained articles: 354</p> <p>↓</p> <p>New retained articles: 2</p>	<p>Search two</p> <p>Keywords: (((attitudes OR beliefs)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices)</p> <p>↓</p> <p>Inclusion criteria:</p> <p>Publication dates: 2004- 2015</p> <p>Language English</p> <p>↓</p> <p>Obtained articles: 1</p> <p>↓</p> <p>Relevant articles: 0</p>

<p>New retained articles: 8</p>			
<p>Search three</p> <p>Keywords:</p> <p>((application OR use OR utilization)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices)</p> <p>➡</p> <p>Inclusion criteria: same as previous searches</p> <p>➡</p> <p>Relevant articles: 21</p> <p>➡</p> <p>New retained articles: 3</p>	<p>Search three</p> <p>Keywords:</p> <p>((application OR use OR utilization)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices)</p> <p>➡</p> <p>Inclusion criteria: same as previous searches</p> <p>➡</p> <p>Relevant articles: 33</p> <p>➡</p> <p>New retained articles: 2</p>	<p>(TITLE-ABS-KEY (application OR use) AND TITLE-ABS-KEY (evidence based practice OR evidence based nursing) AND TITLE-ABS-KEY (nursing students OR apprentices))</p> <p>➡</p> <p>Obtained articles: 60</p> <p>➡</p> <p>New retained articles: 2</p>	<p>Search three</p> <p>Keywords:</p> <p>((application OR use OR utilization)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices)</p> <p>➡</p> <p>Inclusion criteria: same as previous searches</p> <p>➡</p> <p>Relevant articles: 0</p>

<p>Search four:</p> <p>Keywords</p> <p>((((teaching[Title/Abstract] OR educating[Title/Abstract] OR training[Title/Abstract])) AND (evidence based practice[Title/Abstract] OR evidence based nursing students[Title/Abstract] OR apprentices[Title/Abstract])) AND (nursing students[Title/Abstract] OR apprentices[Title/Abstract]))</p> <p>➡</p> <p>Inclusion criteria: same as previous searches</p> <p>➡</p> <p>Obtained articles: 33</p> <p>➡</p> <p>New retained articles: 3</p>	<p>Search four</p> <p>Keywords:</p> <p>((((teaching OR educating OR training)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices))</p> <p>➡</p> <p>Obtained articles: 399</p> <p>➡</p> <p>New retained articles: 5</p>	<p>Search four</p> <p>Keywords:</p> <p>((TITLE-ABS-KEY (teaching OR educating OR training) AND TITLE-ABS-KEY (evidence based practice OR evidence based nursing) AND TITLE-ABS-KEY (nursing students OR apprentices)))</p> <p>➡</p> <p>Inclusion criteria: same as previous searches</p> <p>➡</p> <p>Obtained articles: 480</p> <p>➡</p> <p>New retained articles: 2</p>	<p>Search four</p> <p>((((teaching OR educating OR training)) AND (evidence based practice OR evidence based nursing)) AND (nursing students OR apprentices))</p> <p>➡</p> <p>Inclusion criteria: Same as previous searches</p> <p>➡</p> <p>Obtained articles: 5</p> <p>➡</p> <p>New retained articles: 0</p>	<p>Total articles from PUBMED: 40</p> <p>Total Retained articles: 70</p>	<p>Total articles: 20</p>	<p>Total articles from Scopus: 9</p>	<p>Total articles from Africa wide information: 1</p>
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II. Questionnaire

Study year: - _____

Evidence-based practice

This is a survey designed to evaluate various aspects of Evidence-based practice. Please answer truthfully (i.e. Do not tell us what you THINK we want to hear, rather tell us what YOU really believe) and complete all the questions.

All responses will be treated in strict anonymity and seen only by the researcher and research assistants. .
Only the aggregate results will be published.

Thank you for your participation.

Please circle the most appropriate response:

Please indicate how much you agree/disagree with the following statements.

		Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
1.	I have a clear understanding of what evidence-based practice is.	6	5	4	3	2	1
2.	Research using clinical trials is generally more reliable than research using the observational method.	6	5	4	3	2	1
3.	The evidence-based practice process requires the appropriate identification and formulation of clinical questions.	6	5	4	3	2	1
4.	Effective searching skills/easy access to bibliographic databases and evidence sources are essential to practising evidence-based practice.	6	5	4	3	2	1
5.	Evidence-based practice requires the use of critical appraisal skills to ensure the quality of all the research papers retrieved.	6	5	4	3	2	1

For the purposes of the rest of this questionnaire, we define Evidence-Based practice as follows:-

Practicing evidence-based practice means the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients. That is, looking up, appraising and applying both basic, factual information as well as disease- and condition-specific evidence(Johnston et al., 2003)

		Every day	Every other day	Every week	Every month	Never
6.	How frequently do you access research evidence <u>in general</u> ?	5	4	3	2	1
7.	How frequently do you access research evidence <u>via the internet</u>	5	4	3	2	1
8.	How frequently do you access research evidence <u>from a textbook</u> ?	5	4	3	2	1
9.	How frequently do you access research evidence <u>from original research papers</u> ?	5	4	3	2	1
10.	How frequently do you access research evidence <u>from the Cochrane database</u> ?	5	4	3	2	1
11.	How frequently do you access research evidence <u>from MEDLINE and CINAHL</u> (the Cumulative Index to Nursing and Allied Health Literature)?	5	4	3	2	1
12.	How much time do you spend every day finding or looking up evidence (or content material)? [This does <u>NOT</u> include your study time -- <u>ONLY</u> the time it takes you to retrieve the material] _____mins					

13. **This is a 4-part question.**

- i) **FOR THE MOST RECENT PATIENT** you cared for, how much time did you spend looking up the evidence (or content material) relating to his/her illness? [This does NOT include your study time -- ONLY the time it took you to retrieve the material]

_____mins

- ii) Where (what specific sources) did you find this evidence? (you can choose more than one option)

- ☐ On the internet
- ☐ From a textbook
- ☐ From original research papers
- ☐ From the Cochrane database
- ☐ MEDLINE and CINAHL (the Cumulative Index to Nursing and Allied Health Literature)

iii)	How much, in terms of percentage, did the evidence contribute to your understanding of the disease/condition?				
	>80%	61-80%	41-60%	21-40%	0-20%
	5	4	3	2	1

iv)	How much, in terms of percentage, did the evidence relate to patient-oriented outcomes?				
	>80%	61-80%	41-60%	21-40%	0-20%
	5	4	3	2	1

14. In your opinion and judgement, how much has the practice of evidence-based practice, on average, affected the management or outcome of the patients you have cared for?

Completely	A lot	Moderately	Somewhat	A little	Not at all
6	5	4	3	2	1

15. During teaching rounds or clinical instruction how frequently is current best evidence about the particular clinical problem at hand discussed?

Completely	A lot	Moderately	Somewhat	A little	Not at all
6	5	4	3	2	1

16. How frequently have you raised the role of current best evidence at these rounds/sessions?

All the time	Often	Sometimes	Occasionally	Rarely	Never
6	5	4	3	2	1

17. How much confidence do you have in your clinical decision-making?

A lot	A moderate	Some	A little	None at all
5	4	3	2	1

18. How easy or difficult has it been for you to practise evidence-based practice as a nursing student in the last month?

Very easy	Moderately easy	Easy	Difficult	Moderately difficult	Very difficult
6	5	4	3	2	1

19. How prepared have you been for your clinical teaching sessions in the last clinical rotation?

well prepared	Moderately prepared	Somewhat prepared	Somewhat unprepared	Moderately unprepared	Completely unprepared
6	5	4	3	2	1

20. How useful do you believe evidence-based practice will be in your future practice as a nurse?

Very useful	Somewhat useful	Useful	Not useful	Somewhat useless	Completely useless
6	5	4	3	2	1

21. How willing are you to practice evidence-based practice as a nurse in the future?

Very willing	Moderately willing	Willing	Unwilling	Moderately unwilling	Very unwilling
6	5	4	3	2	1

Please indicate how much you agree/disagree with the following statements.

	Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
22. Evidence-based practice is “cook-book” that disregards clinical experience.	6	5	4	3	2	1
23. There is no reason for me personally to adopt evidence-based practice because it is just a “fad” (or “fashion”) that will pass with time.	6	5	4	3	2	1
24. Evidence-based practice is the future of clinical nursing and will become the standard of care.	6	5	4	3	2	1
25. It is easy to find the evidence in order to apply evidence-based practice.	6	5	4	3	2	1
26. Evidence-based practice takes too much time for busy nursing students.	6	5	4	3	2	1
27. If evidence-based practice is valid, then anyone can see patients and do what nurses do.	6	5	4	3	2	1
28. Evidence-based practice ignores the “art” of nursing.	6	5	4	3	2	1
29. Nurses, in general, should not practise evidence-based practice because nursing is about people and patients, not statistics.	6	5	4	3	2	1
30. Previous work experience is more important than research findings in choosing the best treatment available for a patient.	6	5	4	3	2	1
31. You personally appreciate the advantages of practising evidence-based practice.	6	5	4	3	2	1
32. Evidence-based practice should be an integral part of the undergraduate nursing curriculum.	6	5	4	3	2	1
33. From your personal observation and experience, evidence-based practice is being applied currently in Rwanda.	6	5	4	3	2	1

34. If you were to use evidence-based practice, how would you prefer to be given the evidence (or content material)?

- ☐ Via the library
- ☐ Via a desktop computer at home
- ☐ Via a desktop computer in the patient care environment
- ☐ Via a mobile, handheld computer

35. Overall, how frequently (on average) do you apply evidence-based practice?

Every day	Every other day	Every week	Every month	Never
5	4	3	2	1

36. Do you consider yourself a practitioner of evidence-based practice currently?

☐ Yes (Stop Here!)

Yes

No

37. I don't practise evidence-based practice because my lecturers, clinical instructors and qualified nurses don't.

1

2

38. I don't practise evidence-based practice because I don't know how.

1

2

39. I don't practise evidence-based practice because I don't believe in it.

1

2

40. I don't practise evidence-based practice because my colleagues don't

1

2

41. I don't practise evidence-based practice because I don't have time.

1

2

42. I don't practise evidence-based practice because of personal procrastination in changing old habits.

1

2

43. Other reason(s): (please specify) _____

Thank you for taking the time to complete this survey.

Used with permission from Johnston et al. (2003)

III. Change made to the Knowledge, Attitudes and Behaviours Questionnaire

Wording in KABQ	Changes made
Questions 1-5, definition, 14, 18, 20, 21, 22-29, 31-43. “evidence-Based medicine”	“Evidence-based Medicine” is replaced by “Evidence-based Practice”
6-12. “Medical evidence”	“Medical evidence” is replaced by “research evidence”
Question 12 compared to one year ago	removed
Question 13, iv) i.e. quality of life, morbidity	removed
Question 13, ii. (excluding MEDLINE and Cochrane Reviews)	removed
Question 15, 13.ii) Secondary sources such as ACP Journal Club, the journal Evidence-Based Medicine, POEMs (Patient-oriented evidence that matters) or CATs (Critically appraised topics)?	“secondary sources such as ACP Journal Club, the journal Evidence-Based Medicine, POEMs (Patient-oriented evidence that matters) or CATs (Critically appraised topics)” is replaced by MEDLINE and CINAHL (the Cumulative Index to Nursing and Allied Health Literature)’
Question 13.i), 14 you clerked,	“You clerked” is replaced by “you cared for”
Question 15 bedside teaching	Replaced by “clinical instruction”
Question 18, medical student	“Medical student” is replaced by “nursing student”
Question 19, last month	“Last month” is replaced by “last clinical rotation”
Question 20, 27, 29 doctor	“doctor” is replaced by “nurse”
Question 22, 28, 29 medicine	“medicine” is replaced by “nursing”
Question 25, 35 practice	“practice” is replaced by “apply”
Question 32, medical curriculum.	“Medical curriculum” is replaced by “nursing curriculum”

Question 33, From your personal observation and experience, evidence-based medicine is being practiced currently in Hong Kong.	“Hong Kong” is replaced by “Rwanda”, “practiced” by “applied”
Question 37 “consultants and professors”	Replaced by lectures, clinical instructors and qualified nurses

IV. Expert panel information letter and consent form

Expert code number.....

Researcher: Mrs I Favorite

Rue de Nyarugunga

P.O. Box 3286 Kigali

Cell phone +250 783 37 47 07

E-MAIL: favorite.iardukunda@gmail.com

Title of the study: “Knowledge, attitudes and application of evidence-based practice by third and fourth year undergraduate nursing students at the University of Rwanda (UR)”

Dear expert panel member.

I am currently a final year MSc Nursing student at the University of Cape Town. I hereby request you to be part of an expert panel to validate the data collection instrument to be used for the proposed study (Appendix G). As a member of the expert panel, you will be required to establish the content validity for each question using a four point ordinal scale. The following is an example of the rating scale to use when assessing content validity:

1= Irrelevant

2= Unable to assess relevance without item revision

3= Relevant but needs minor alteration

4= Extremely relevant

Additions and omissions must be indicated in the space provided for comments.

For the evaluation of face validity, a checklist containing the following items will be used:

Layout, Format, Quality of printing/easy to read, instructions at the beginning of the questionnaire are clear and easy to understand, length of the questionnaire.

You will be requested to indicate your view by making a $\sqrt{\quad}$ under the appropriate column.

Participation is voluntary. You will not benefit directly by participating as an expert panel member but the study results may assist you in designing appropriate educational programs on evidence-based practice.

.

CONSENT FORM: EXPERT PANEL MEMBER

I _____ fully understand and agree to the contents of the information letter. I understand that I may withdraw from being a member of the expert panel group without any penalty. I hereby give my consent to participate as a member of the expert panel group freely and without any reservations.

Signature panel member..... Date.....

V. Content and Face validation checklists

Content validation

Index of content validity (ICV)

Please choose one box for each statement relating to the questionnaire.

Section/question	1= Irrelevant	2= Unable to assess relevance without item revision	3= Relevant but needs minor alteration	4= Extremely relevant
Section 1 Q1				
Q2				
Q3				
Q4				
Q5				
Section 2 Q6				
Q7				
Q8				
Q9				
Q10				
Q11				
Q12				
Q13				
Section 3 Q14				
Q15				
Q16				
Q17				
Q18				
Q19				
Q20				
Q21				
Section 4 Q22				

Q23				
Q24				
Q25				
Q26				
Q27				
Q28				
Q29				
Q30				
Q31				
Q32				
Q33				
Q34				
Q35				
Q36				
Section 5 Q37				
Q38				
Q39				
Q 40				
Q41				
Q42				
Q43				

Face validation

Please choose one box for each statement relating to the questionnaire.

	Very skilful	satisfactory	Needs improvement	Unacceptable
Layout				
Format				

Quality of printing/easy to ready				
Instructions at the beginning pf the questionnaire are clear and easy to understand				
Length of the questionnaire				

VI. Expert opinion on the CVI of the questionnaire.

1. Content validation

Index of content validity (CVI)

Section/question	1= Irrelevant	2= Unable to assess relevance without item revision	3= Relevant but needs minor alteration	4= Extremely relevant
Section 1 Q1				2(100%)
Q2				2(100%)
Q3				2(100%)
Q4				2(100%)
Q5				2(100%)
Section 2 Q6				2(100%)
Q7				2(100%)
Q8				2(100%)
Q9				2(100%)
Q10				2(100%)
Q11				2(100%)
Q12				2(100%)
Q13(i)				2(100%)
Q13(ii)				2(100%)
Q13(iii)				2(100%)
Q13(iv)				2(100%)
Section 3 Q14				2(100%)
Q15				2(100%)
Q16				2(100%)
Q17				2(100%)
Q18				2(100%)
Q19				2(100%)
Q20				2(100%)

Q21				2(100%)
Section 4 Q22			2(100%)	
Q23				2(100%)
Q24				2(100%)
Q25				2(100%)
Q26				2(100%)
Q27				2(100%)
Q28				2(100%)
Q29				2(100%)
Q30				2(100%)
Q31				2(100%)
Q32				2(100%)
Q33				2(100%)
Q34				2(100%)
Q35				2(100%)
Q36				2(100%)
Section 5 Q37				2(100%)
Q38				2(100%)
Q39				2(100%)
Q 40				2(100%)
Q41				2(100%)
Q42			2(100%)	
Q43				2(100%)

2. Face validation

	Very skillful	Satisfactory	Needs improvement	Unacceptable
Layout			2(100%)	
Format	2(100%)			

Quality of printing/easy to ready			2(100%)	
Instructions at the beginning pf the questionnaire are clear and easy to understand	2(100%)			
Length of the questionnaire	2(100%)			

VII. Letter to the Ministry of Education

**Rue de Nyarugunga
P.O. Box 3286 Kigali
favorite.iradukunda@gmail.com
+250 783 37 47 07**

**Minister of Education
P.O. Box 622, Kigali
Rwanda**

30 April 2015

Dear Sir,

Re: Request for a Research Clearance Certificate in the Republic of Rwanda

I am Favorite Iradukunda, a Master's candidate, department of Health & Rehabilitation Sciences, University of Cape Town (UCT). I am also a staff member at the University of Rwanda, School of Nursing and Midwifery. I would like to request a Research Clearance Certificate to conduct a study entitled "Knowledge, attitudes and application of evidence-based practice by third and fourth year undergraduate nursing students at the University of Rwanda (UR)". The aim of this study is to determine the self-perceived knowledge, attitudes and application of Evidence-based Practice by third and fourth year undergraduate nursing students. Findings from this study may inform nursing curriculum adjustment.

Every effort has been made in the development of this research study to be sensitive to all ethical issues, and the study was approved by the Faculty of Health Sciences Human Research Ethics Committee (HREC Ref: 253/2015) of the University of Cape Town. I am affiliated to the University of Rwanda, and I will work closely with a supervisor from the University of Cape Town and a co-supervisor from the University of Rwanda.

Enclosed please find a copy of the research proposal, ethical approval from Faculty of Health Sciences Human Research Ethics Committee of the University of Cape Town, and other required documents.

Any recommendations or suggestions will be considered and acknowledged.

Thanking you for your time,

Yours Sincerely,

Favorite Iradukunda

VIII. Information Sheet

A study to determine “Knowledge, attitudes and application of evidence-based practice by third and fourth year undergraduate nursing students at University of Rwanda (UR)”.

RESEARCHER’S DETAILS

Miss Iradukunda Favorite

Master of Science in nursing student

University of Cape Town

Kigali-Rwanda

Email: favorite.iradukunda@gmail.com

TEL: + 250 78 337 47 07 OR +270 604 63 67 15

SUPERVISOR’S DETAILS

Associate Prof. Pat Mayers

University of Cape Town

Division of Nursing & Midwifery

Email: pat.mayers@uct.ac.za

UCT HUMAN RESEARCH ETHICS COMMITTEE DETAILS:

Faculty of Health Sciences

Room E52-24 Groote Schuur Hospital Old Main Building

OBSERVATORY, 7925

TEL: 021-406 6626

Dear student,

INVITATION TO PARTICIPATE IN A RESEARCH STUDY

My name is Iradukunda Favorite and I am studying towards a Master’s of Science in Nursing at the University of Cape Town (UCT).

I am conducting a study entitled “Knowledge, attitudes and application of Evidence-based practice by third and fourth year undergraduate nursing students at the University of Rwanda (UR)”.

The aim of this study is to determine self-perceived knowledge, attitudes and application with respect to evidence-based practice by third and fourth year undergraduate nursing students. Findings from this study will inform future curriculum development.

You have been asked to participate in the study as you would have been exposed to teaching input in your second year about the principles of evidence-based practice.

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the study.

Explanation of Procedures

This research study is designed to examine self-perceived knowledge, attitudes and application of evidence-based practice. Participation in the study involves completing a questionnaire, which will take approximately one hour of your time. The questionnaire is in user-friendly English.

Risks and Discomforts

There are no risks or discomforts anticipated from your participation in the study. Should you, however, experience any distress, please inform the researcher/research assistants, who will assist you.

Benefits

There is no direct benefit from your participation in the study. It is hoped however that the findings will inform the curriculum planning for the nursing program.

Voluntary participation and right to withdraw

Participation in this study is voluntary; if you choose not to participate your right to do this will be respected. You are free to withdraw consent and discontinue participation in this study at any time without prejudice.

Anonymity

Information gathered during this study will be anonymous. You are not required to put your name on the questionnaire. No one will have access to the information on the questionnaire except for the researcher and her supervisor.

The results of this research will be submitted for examination, and may be published. No names or any other identifying information will be included in any published documents.

Ethics approval/opportunity to ask questions

The study was approved by the Faculty of Health Sciences Human Research Ethics Committee (FHS HREC Ref...) of the University of Cape Town. You have the right to ask any questions regarding the questionnaire or the study and have them answered before or during the data collection process. If you have any question or would like further information about the study, please email me at favorite.iradukunda@gmail.com or phone me at +250783374707/+270604636715 or contact my supervisor Associate Professor Pat Mayers: pat.mayers@uct.ac.za. You may also contact the University of Cape Town, Faculty of Health Sciences Human Research Ethics committee at 021-4066626 in case you want more information about your rights and welfare as research participants.

Thank you in advance for your participation.

Sincerely,

Favorite Iradukunda.

IX. Ethical approval from the Faculty of Health Sciences, University of Cape Town



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone (021) 406 6338 • Facsimile (021) 406 6411
Email: souretta.thomson@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/foriny

24 April 2015

HREC REF: 253/2015

A/Prof P Mayers
Health & Rehab
Nursing & Midwifery
F-Floor, OMB

Dear A/Prof Mayers

PROJECT TITLE: KNOWLEDGE, ATTITUDES AND APPLICATION OF EVIDENCE-BASED PRACTICE BY THIRD AND FOURTH YEAR UNDERGRADUATE NURSING STUDENTS AT THE UNIVERSITY OF RWANDA (UR) (Masters Candidate - Ms I Favorite)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30th April 2016.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student, Ms Iradukunda Favorite will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

**PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE**

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB0001938

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical

HREC 253/2015

X. Approval from the Rwandan, Ministry of Education

REPUBLIC OF RWANDA



MINISTRY OF EDUCATION
P.O.BOX 622 KIGALI

Kigali, 27/05/2015
N° 1378/12.00/2015

Ms. Iradukunda Favorite
MSc Candidate
Department of Health and rehabilitation Sciences
University of Cape Town, South Africa
E-mail: favoriteiradukunda@gmail.com
Tel.: (+250)783374707

Dear Ms. Favorite,

RE: Approval to Conduct Research in Rwanda under the Project Title: "Knowledge, Attitudes and Application of Evidence-Based Practice by Third and Fourth year Nursing Students at the University of Rwanda"

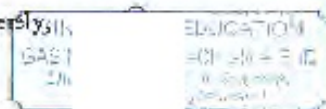
I am pleased to attach a copy of research clearance, which has been granted to you to conduct research on the above title.

I wish to remind you that the research clearance number should be cited in your final research report. The research should be carried out under affiliation of the University of Rwanda-College of Medicine and Health Sciences (UR-CMHS), under supervision of Dr. Jeanne Kagwiza, Dean of School of Sciences, UR-CMHS.

You are requested to submit the final report after completion of your research activities to the Ministry of Education of Rwanda.

I wish you success in your research.

Yours Sincerely,



Marie-Christine GASHUMBA, Ph.D
Director General of Science, Technology and Research
Ministry of Education



Cc.

- Hon. Minister of Education
- Hon. Minister of State in Charge of TVET
- Hon. Minister of State in Charge of Primary and Secondary Education
- Permanent Secretary, Ministry of Education
- Dr. Jeanne Kagwiza, Dean of School of Sciences, UR-CMHS

REPUBLIC OF RWANDA

Kigali, 27/05/2015
N° 1377/12.00/2015



MINISTRY OF EDUCATION
P.O.BOX 622 KIGALI



Re: Permission to Carry out Research in Rwanda - No: MINEDOC/S&T/305/2015

The Permission is hereby granted to **Ms. Iradukunda Favarite**, MSc Candidate, Department of Health and rehabilitation Sciences, University of Cape Town, South Africa, to carry out research on: **"Knowledge, Attitudes and Application of Evidence-Based Practice by Third and Fourth year Nursing Students at the University of Rwanda"**.

The research will be carried out at the University of Rwanda-College of Medicine and Health Sciences. During the research activities, the questionnaires will be administered to all third and fourth year undergraduate nursing students.

The period of research is from 22nd May, 2015 to 31st July, 2016. It may be renewed if necessary, in which case a new permission will be sought by the researcher.

Please allow the **above mentioned researcher**, any help and support she might require to conduct this research.

Yours sincerely,

MIR
GASIBIRWA
Dir.
DIRECTION
Gen. du P.D
de la Recherche
Scientifique



Marie-Christine GASIBIRWA, Ph.D
Director General of Science, Technology and Research
Ministry of Education

XI. Informed Consent

Study title: Knowledge, Attitudes and application of evidence-based practice by third and fourth year undergraduate nursing students at the University of Rwanda (UR).

I _____ have read the Information Letter. I understand what is required of me, and I have had all my questions answered. I do not feel that I am forced to take part in this study and I am doing so of my own free will. I know that I can withdraw at any time if I so wish and that it will have no bad consequences for me.

Signed:

Participant

Date and place

Researcher

Date and place